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Art Unit or Office: 1713 Building & Room Number: CP3-8B28

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10/024,255

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=> s (cation### or anion### or ion) (1w) (exchange material or exchange membrane)
L1       26242 (CATION### OR ANION### OR ION) (1W) (EXCHANGE MATERIAL OR EXCHAN
               GE MEMBRANE)

=> s bind#### (5a) (very low density (1w) ethylene or polyethylene)
L2        7628 BIND#### (5A) (VERY LOW DENSITY (1W) ETHYLENE OR POLYETHYLENE)

=> s l1 and l2
L3         116 L1 AND L2

=> s l3 and heterogeneous (5w) exchange
L4          23 L3 AND HETEROGENEOUS (5W) EXCHANGE

=> d l4 1-23 ibib abs

L4   ANSWER 1 OF 23  USPATFULL on STN
ACCESSION NUMBER:        2003:146871  USPATFULL
TITLE:                   Methods and apparatus for the formation of
                         heterogeneous ion-exchange
                         membranes
INVENTOR(S):             Bernatowicz, Joseph M., Langhorne, PA, UNITED STATES
                         Snow, Michael J., Rancho Santa Fe, CA, UNITED STATES
                         O'Hare, Ronald J., South Laguna, CA, UNITED STATES

                              NUMBER         KIND    DATE
                         ---------------- ------ --------
PATENT INFORMATION:      US 2003100618      A1   20030529
APPLICATION INFO.:       US 2003-336298     A1   20030103  (10)
RELATED APPLN. INFO.:    Division of Ser. No. US 1999-444055, filed on 19 Nov
                         1999, GRANTED, Pat. No. US 6503957
DOCUMENT TYPE:           Utility
FILE SEGMENT:            APPLICATION
LEGAL REPRESENTATIVE:    Frank Frisenda, Jr., Suite 470, 3993 Howard Hughes
                         Parkway, Las Vegas, NV, 89109
NUMBER OF CLAIMS:        17
EXEMPLARY CLAIM:         1
NUMBER OF DRAWINGS:      1 Drawing Page(s)
LINE COUNT:              608
CAS INDEXING IS AVAILABLE FOR THIS PATENT.
```

AB The present invention provides methods and apparatus for the formation of **heterogeneous ion-exchange membranes** by prescribed in-line compounding and extrusion of a polymeric binder and heat sensitive ion-exchange resin. The ion-exchange resin is incorporated, at a late process stage, into the melted matrix polymer at relatively low temperature and residence time prior to transfer to a die head for extrusion. In the presently preferred embodiment, the in-line compounding apparatus comprises a twin-screw compounding extruder, for effecting late stage kneading and mixing of ion-exchange resin and optional additives to the polymer melt, prior to compression to transfer the blended polymer melt to a die head for extrusion. Accordingly, the final properties of the resultant **heterogeneous ion-exchange membrane** are enhanced as the blended polymer melt material is not exposed to excessive heat and shear history. Resultant **heterogeneous ion-exchange membranes** and apparatus for treatment of fluid streams utilizing such membranes are also provided.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L4 ANSWER 2 OF 23 USPATFULL on STN

| | | | | |
|---|---|---|---|---|
| ACCESSION NUMBER: | 2003:131534 USPATFULL | | | |
| TITLE: | Apparatus for fluid purification and methods of manufacture and use thereof | | | |
| INVENTOR(S): | Liang, Li-Shiang, Harvard, MA, UNITED STATES<br>Montminy, Emile, Lowell, MA, UNITED STATES | | | |
| PATENT ASSIGNEE(S): | United States Filter Corporation, Palm Desert, CA (U.S. corporation) | | | |
| | NUMBER | KIND | DATE | |
| PATENT INFORMATION: | US 2003089609 | A1 | 20030515 | |
| APPLICATION INFO.: | US 2002-272356 | A1 | 20021015 | (10) |
| | NUMBER | | DATE | |
| PRIORITY INFORMATION: | US 2001-329296P | | 20011015 | (60) |
| DOCUMENT TYPE: | Utility | | | |
| FILE SEGMENT: | APPLICATION | | | |
| LEGAL REPRESENTATIVE: | Peter C. Lando, Wolf, Greenfield & Sacks, P.C., 600 Atlantic Avenue, Boston, MA, 02210 | | | |
| NUMBER OF CLAIMS: | 52 | | | |
| EXEMPLARY CLAIM: | 1 | | | |
| NUMBER OF DRAWINGS: | 7 Drawing Page(s) | | | |
| LINE COUNT: | 1007 | | | |

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

AB The present invention generally relates to devices able to purify fluids electrically that are contained within pressure vessels, as well as to methods of manufacture and use thereof. Liquids or other fluids to be purified enter the purification device and, under the influence of an electric field, are treated to produce an ion-depleted liquid. Species from the entering liquids are collected to produce an ion-concentrated liquid. Increasing the exterior pressure on the device may reduce the pressure difference between the interior of the device and the exterior, which may reduce manufacturing costs or simplify construction.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L4 ANSWER 3 OF 23 USPATFULL on STN

| | |
|---|---|
| ACCESSION NUMBER: | 2003:6935 USPATFULL |
| TITLE: | Methods and apparatus for the formation of **heterogeneous ion-exchange** |

**membranes**

INVENTOR(S): Bernatowicz, Joseph M., Langhorne, PA, United States
Snow, Michael J., Rancho Santa Fe, CA, United States
O'Hare, Ronald J., South Laguna, CA, United States

PATENT ASSIGNEE(S): Electropure, Inc., Laguna Hills, CA, United States (U.S. corporation)

| | NUMBER | KIND | DATE |
|---|---|---|---|
| PATENT INFORMATION: | US 6503957 | B1 | 20030107 |
| APPLICATION INFO.: | US 1999-444055 | | 19991119 (9) |

DOCUMENT TYPE: Utility
FILE SEGMENT: GRANTED
PRIMARY EXAMINER: Zitomer, Fred
LEGAL REPRESENTATIVE: Frisenda, Jr, Frank
NUMBER OF CLAIMS: 14
EXEMPLARY CLAIM: 1
NUMBER OF DRAWINGS: 1 Drawing Figure(s); 1 Drawing Page(s)
LINE COUNT: 579
CAS INDEXING IS AVAILABLE FOR THIS PATENT.

AB The present invention provides methods and apparatus for the formation of **heterogeneous ion-exchange membranes** by prescribed in-line compounding and extrusion of a polymeric binder and heat sensitive ion-exchange resin. The ion-exchange resin is incorporated, at a late process stage, into the melted matrix polymer at relatively low temperature and residence time prior to transfer to a die head for extrusion. In the presently preferred embodiment, the in-line compounding apparatus comprises a twin-screw compounding extruder, for effecting late stage kneading and mixing of ion-exchange resin and optional additives to the polymer melt, prior to compression to transfer the blended polymer melt to a die head for extrusion. Accordingly, the final properties of the resultant **heterogeneous ion-exchange membrane** are enhanced as the blended polymer melt material is not exposed to excessive heat and shear history. Resultant **heterogeneous ion-exchange membranes** and apparatus for treatment of fluid streams utilizing such membranes are also provided.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L4 ANSWER 4 OF 23 USPATFULL on STN
ACCESSION NUMBER: 2002:236136 USPATFULL
TITLE: **Heterogeneous ion exchange membrane** and method of manufacturing thereof

INVENTOR(S): Towe, Ian Glenn, Caledon Village, CANADA
Yagar, Mathew J., Waterloo, CANADA
Li, Guanghui, Guelph, CANADA

| | NUMBER | KIND | DATE |
|---|---|---|---|
| PATENT INFORMATION: | US 2002128334 | A1 | 20020912 |
| APPLICATION INFO.: | US 2001-24255 | A1 | 20011221 (10) |

RELATED APPLN. INFO.: Continuation-in-part of Ser. No. WO 2000-CA741, filed on 21 Jun 2000, UNKNOWN

| | NUMBER | DATE |
|---|---|---|
| PRIORITY INFORMATION: | CA 1999-2275999 | 19990621 |

DOCUMENT TYPE: Utility
FILE SEGMENT: APPLICATION
LEGAL REPRESENTATIVE: ARNE I. FORS, GOWLING, STRATHY & HENDERSON, SUITE 4900, COMMERCE COURT WEST, TORONTO, ON, M5L 1J3

NUMBER OF CLAIMS: 12
EXEMPLARY CLAIM: 1
NUMBER OF DRAWINGS: 2 Drawing Page(s)
LINE COUNT: 479
CAS INDEXING IS AVAILABLE FOR THIS PATENT.
AB A **heterogeneous ion exchange material** is provided which comprises an ion exchange resin incorporated within a binder, the binder comprising a material selected from the group consisting of: (i) a Metallocene catalyzed linear low density polyethylene, (ii) a very low density polyethylene or ultra low density polyethylene processed using either Ziegler-Natta catalysts or Metallocene catalysts, (iii) a thermoplastic elastomeric olefin comprising a polypropylene continuous phase with an ethylene-propylene-diene monomer or ethylene-propylene rubber rubbery phase dispersed through the polypropylene continuous phase, and (iv) a thermoplastic vulcanizate comprising a polypropylene continuous phase with an ethylene-propylene-diene monomer, ethylene-propylene rubber, nitrile-butadiene rubber, natural rubber or ethylene vinyl acetate rubbery phase dispersed through the polypropylene continuous phase. The **ion exchange membrane** can be manufactured using advanced extrusion techniques, including computer-controlled material fee, computer-controlled automatic die thickness adjustment with independently adjustable lip segments and nuclear gauge detection with feed-back control. It can also be manufactured by injection molding.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L4 ANSWER 5 OF 23 USPATFULL on STN
ACCESSION NUMBER: 2002:78793 USPATFULL
TITLE: Heterogeneous anion exchanger
INVENTOR(S): Sugaya, Yoshio, Kanagawa, JAPAN
PATENT ASSIGNEE(S): Asahi Glass Company, Limited, Chiyoda-ku, JAPAN, 100-8405 (non-U.S. corporation)

| | NUMBER | KIND | DATE | |
|---|---|---|---|---|
| PATENT INFORMATION: | US 2002042451 | A1 | 20020411 | |
| | US 6632848 | B2 | 20031014 | |
| APPLICATION INFO.: | US 2001-909904 | A1 | 20010723 | (9) |

| | NUMBER | DATE |
|---|---|---|
| PRIORITY INFORMATION: | JP 2000-221831 | 20000724 |

DOCUMENT TYPE: Utility
FILE SEGMENT: APPLICATION
LEGAL REPRESENTATIVE: OBLON SPIVAK MCCLELLAND MAIER & NEUSTADT PC, FOURTH FLOOR, 1755 JEFFERSON DAVIS HIGHWAY, ARLINGTON, VA, 22202
NUMBER OF CLAIMS: 10
EXEMPLARY CLAIM: 1
LINE COUNT: 548
CAS INDEXING IS AVAILABLE FOR THIS PATENT.
AB A heterogeneous anion exchanger comprising from 35 to 85 mass % of an anion exchange resin and from 15 to 65 mass % of a binder polymer, wherein the anion exchange resin is made of a polymer having repeating units represented by the following formula (1): ##STR1##

wherein R is a C.sub.3-8 alkylene group or an alkyleneoxyalkyl group having a total carbon number of from 4 to 9, R.sup.1 is a C.sub.1-4 alkyl group which may be substituted by a hydroxyl group, each of R.sup.2 and R.sup.3 is a C.sub.1-4 alkyl group, and X.sup.- is an anion,

and wherein any hydrogen atom bonded to the benzene ring may be substituted by an alkyl group or a halogen atom.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L4 ANSWER 6 OF 23 USPATFULL on STN
ACCESSION NUMBER: 2001:196492 USPATFULL
TITLE: Method for extracting amine compounds from a liquid medium
INVENTOR(S): Canivenc, Edith, Lyons, France
Horbez, Dominique, Franconville, France
PATENT ASSIGNEE(S): Rhodia Fiber & Resin Intermediates, Courbevoie Cedex, France (non-U.S. corporation)

| | NUMBER | KIND | DATE | |
|---|---|---|---|---|
| PATENT INFORMATION: | US 6312578 | B1 | 20011106 | |
| | WO 9815341 | | 19980416 | |
| APPLICATION INFO.: | US 1999-269783 | | 19990907 | (9) |
| | WO 1997-FR1760 | | 19971003 | |
| | | | 19990907 | PCT 371 date |
| | | | 19990907 | PCT 102(e) date |

| | NUMBER | DATE |
|---|---|---|
| PRIORITY INFORMATION: | FR 1996-12327 | 19961004 |

DOCUMENT TYPE: Utility
FILE SEGMENT: GRANTED
PRIMARY EXAMINER: Phasge, Arun S.
LEGAL REPRESENTATIVE: Burns, Doane, Swecker & Mathis, L.L.P.
NUMBER OF CLAIMS: 15
EXEMPLARY CLAIM: 1
LINE COUNT: 572
CAS INDEXING IS AVAILABLE FOR THIS PATENT.
AB The invention concerns a method for extracting by electrodialysis a compound comprising at least amine functions capable of protonation from a liquid medium. More particularly it concerns a method for extracting, and separating at least the monomers comprising amine functions capable of protonation from a liquid medium derived from the hydrolysis of polyamides. The method of extraction from a liquid medium consists in subjecting to protonation the amine function(s) of the compounds to be extracted by adjusting the pH of the medium and in separating the compounds by passing them through a cationic membrane under the effect of an electric current. The invention is particularly applicable in processes for the chemical stabilisation of polyamides such as the PA 66 PA 6.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L4 ANSWER 7 OF 23 USPATFULL on STN
ACCESSION NUMBER: 2001:67051 USPATFULL
TITLE: Method and apparatus for producing deionized water
INVENTOR(S): Terada, Ichiro, Yokohama, Japan
Toda, Hiroshi, Ichihara, Japan
Iwamoto, Junjiro, Yokohama, Japan
Umemura, Kazuo, Yokohama, Japan
Komatsu, Ken, Yokohama, Japan
Hoshi, Tohru, Yokohama, Japan
Huehnergard, Mark Philip, Guelph, Canada
Tessier, David Florian, Guelph, Canada
Towe, Ian Glenn, Guelph, Canada
PATENT ASSIGNEE(S): Asahi Glass Company Ltd., Tokyo, Japan (non-U.S.

corporation)
Glegg Water Conditioning, Incorporated, Guelph, Canada (non-U.S. corporation)

| | NUMBER | KIND | DATE | |
|---|---|---|---|---|
| PATENT INFORMATION: | US 6228240 | B1 | 20010508 | |
| APPLICATION INFO.: | US 1999-338570 | | 19990623 | (9) |
| RELATED APPLN. INFO.: | Division of Ser. No. US 952218, now patented, Pat. No. US 5961805 | | | |

| | NUMBER | DATE |
|---|---|---|
| PRIORITY INFORMATION: | JP 1996-64783 | 19960321 |
| | JP 1997-40026 | 19970207 |

DOCUMENT TYPE: Utility
FILE SEGMENT: Granted
PRIMARY EXAMINER: Phasge, Arun S.
LEGAL REPRESENTATIVE: Oblon, Spivak, McClelland, Maier & Neustadt, P.C.
NUMBER OF CLAIMS: 11
EXEMPLARY CLAIM: 1
NUMBER OF DRAWINGS: 6 Drawing Figure(s); 4 Drawing Page(s)
LINE COUNT: 825
CAS INDEXING IS AVAILABLE FOR THIS PATENT.

AB An apparatus for producing deionized water consisting essentially of an electrodialyzer having **cation exchange membranes** and **anion exchange membranes** alternately arranged between a cathode and an anode to form demineralizing compartments and concentrating compartments, and ion exchangers accommodated in the demineralizing compartments, wherein a pressure of from 0.1 to 20 kg/cm.sup.2 is exerted between the ion exchangers accommodated in the demineralizing compartments and the **cation exchange membranes** and **anion exchange membranes** defining the demineralizing compartments.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L4 ANSWER 8 OF 23 USPATFULL on STN
ACCESSION NUMBER: 2001:51414 USPATFULL
TITLE: Method for separating a catalyst by membrane electrodialysis
INVENTOR(S): Fache, Eric, Villeurbanne, France
Horbez, Dominique, Franconville, France
Leconte, Philippe, Meyzieu, France
PATENT ASSIGNEE(S): Rhodia Fiber and Resin Intermediates, Courbevoie Cedex, France (non-U.S. corporation)

| | NUMBER | KIND | DATE | |
|---|---|---|---|---|
| PATENT INFORMATION: | US 6214190 | B1 | 20010410 | |
| | WO 9736673 | | 19971009 | |
| APPLICATION INFO.: | US 1999-155597 | | 19990208 | (9) |
| | WO 1997-FR559 | | 19970327 | |
| | | | 19990208 | PCT 371 date |
| | | | 19990208 | PCT 102(e) date |

| | NUMBER | DATE |
|---|---|---|
| PRIORITY INFORMATION: | FR 1996-4379 | 19960402 |

DOCUMENT TYPE: Utility
FILE SEGMENT: Granted

PRIMARY EXAMINER: Phasge, Arun S.
LEGAL REPRESENTATIVE: Burns, Doane, Swecker & Mathis, L.L.P.
NUMBER OF CLAIMS: 14
EXEMPLARY CLAIM: 1
LINE COUNT: 583
CAS INDEXING IS AVAILABLE FOR THIS PATENT.
AB The present invention relates to a process for isolating, by membrane electrodialysis, a catalyst from a solution containing it. More precisely, it relates to the isolation of a catalyst used in a homogeneous phase molecular oxidation reaction. The invention consists of a process for isolating a homogeneous catalyst dissolved in a mixture also containing at least one aliphatic diacid, characterized in that the catalyst contains cobalt and the isolation is performed by membrane electrodialysis.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L4 ANSWER 9 OF 23 USPATFULL on STN
ACCESSION NUMBER: 2001:14217 USPATFULL
TITLE: Industrial scale process for the preparation of 2-hydroxy-4-methylbutyric acid using a nitrilase
INVENTOR(S): Favre-Bulle, Olivier, Lyons, France
Pierrard, Jerome, Lyons, France
David, Christophe, Lyons, France
Morel, Philippe, Chuzelles, France
Horbez, Dominique, Franconville, France
PATENT ASSIGNEE(S): Aventis Animal Nutrition S.A., Antony Cedex, France (non-U.S. corporation)

| | NUMBER | KIND | DATE | |
|---|---|---|---|---|
| PATENT INFORMATION: | US 6180359 | B1 | 20010130 | |
| APPLICATION INFO.: | US 1997-957621 | | 19971024 | (8) |

| | NUMBER | DATE |
|---|---|---|
| PRIORITY INFORMATION: | FR 1996-13077 | 19961025 |

DOCUMENT TYPE: Utility
FILE SEGMENT: Granted
PRIMARY EXAMINER: Carlson, Karen Cochrane
ASSISTANT EXAMINER: Schnizer, Holly
LEGAL REPRESENTATIVE: Finnegan, Henderson, Farabow, Garrett, & Dunner, L.L.P.
NUMBER OF CLAIMS: 24
EXEMPLARY CLAIM: 1
NUMBER OF DRAWINGS: 12 Drawing Figure(s); 7 Drawing Page(s)
LINE COUNT: 1334
CAS INDEXING IS AVAILABLE FOR THIS PATENT.
AB This invention relates to a process for the preparation of 2-hydroxy-4-methylthiobutyric acid or the ammonium salt of 2-hydroxy-4-methylthiobutyric acid by enzymatic hydrolysis of 2-hydroxy-4-methylthiobutyronitrile, comprising:

a) preparing a biological material having a nitrilase activity;

b) immobilizing the biological material,

c) exposing the 2-hydroxy-4-methylthiobutyronitrile to the biological material thus immobilized to obtain the ammonium salt of 2-hydroxy-4-methylthiobutyric acid; and

d) optionally converting the salt obtained to the corresponding acid.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L4 ANSWER 10 OF 23 USPATFULL on STN
ACCESSION NUMBER: 1999:120709 USPATFULL
TITLE: Method and apparatus for producing deionized water
INVENTOR(S): Terada, Ichiro, Yokohama, Japan
Toda, Hiroshi, Ichihara, Japan
Iwamoto, Junjiro, Yokohama, Japan
Umemura, Kazuo, Yokohama, Japan
Komatsu, Ken, Yokohama, Japan
Hoshi, Tohru, Yokohama, Japan
Huehnergard, Mark Philip, Guelph, Canada
Tessier, David Florian, Guelph, Canada
Towe, Ian Glenn, Geulph, Canada
PATENT ASSIGNEE(S): Ashai Glass Company Ltd., Tokyo, Japan (non-U.S. corporation)
Glegg Water Conditioning, Incorporated, Ontario, Canada (non-U.S. corporation)

| | NUMBER | KIND | DATE | |
|---|---|---|---|---|
| PATENT INFORMATION: | US 5961805 | | 19991005 | |
| | WO 9734696 | | 19970925 | |
| APPLICATION INFO.: | US 1997-952218 | | 19971121 | (8) |
| | WO 1997-JP896 | | 19970319 | |
| | | | 19971121 | PCT 371 date |
| | | | 19971121 | PCT 102(e) date |

| | NUMBER | DATE |
|---|---|---|
| PRIORITY INFORMATION: | JP 1996-64783 | 19960321 |
| | JP 1997-40026 | 19970207 |

DOCUMENT TYPE: Utility
FILE SEGMENT: Granted
PRIMARY EXAMINER: Phasge, Arun S.
LEGAL REPRESENTATIVE: Oblon, Spivak, McClelland, Maier & Neustadt, P. C.
NUMBER OF CLAIMS: 8
EXEMPLARY CLAIM: 1
NUMBER OF DRAWINGS: 6 Drawing Figure(s); 4 Drawing Page(s)
LINE COUNT: 834
CAS INDEXING IS AVAILABLE FOR THIS PATENT.
AB An apparatus for producing deionized water consisting essentially of an electrodialyzer having **cation exchange membranes** and **anion exchange membranes** alternately arranged between a cathode and an anode to form demineralizing compartments and concentrating compartments, and ion exchangers accommodated in the demineralizing compartments, wherein a pressure of from 0.1 to 20 kg/cm.sup.2 is exerted between the ion exchangers accommodated in the demineralizing compartments and the **cation exchange membranes** and **anion exchange membranes** defining the demineralizing compartments.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L4 ANSWER 11 OF 23 USPATFULL on STN
ACCESSION NUMBER: 1999:106502 USPATFULL
TITLE: **Heterogeneous ion exchange membrane** and process for its production
INVENTOR(S): Terada, Ichiro, Yokohama, Japan
Higuchi, Yoshiaki, Yokohama, Japan
Miyake, Haruhisa, Yokohama, Japan

Umemura, Kazuo, Yokohama, Japan
PATENT ASSIGNEE(S): Asahi Glass Company Ltd., Tokyo, Japan (non-U.S. corporation)

| | NUMBER | KIND | DATE |
|---|---|---|---|
| PATENT INFORMATION: | US 5948826 | | 19990907 |
| APPLICATION INFO.: | US 1997-898957 | | 19970723 (8) |

| | NUMBER | DATE |
|---|---|---|
| PRIORITY INFORMATION: | JP 1996-194196 | 19960724 |

DOCUMENT TYPE: Utility
FILE SEGMENT: Granted
PRIMARY EXAMINER: Zitomer, Fred
LEGAL REPRESENTATIVE: Oblon, Spivak, McClelland, Maier & Neustadt, P.C.
NUMBER OF CLAIMS: 10
EXEMPLARY CLAIM: 1
LINE COUNT: 456
CAS INDEXING IS AVAILABLE FOR THIS PATENT.
AB A **heterogeneous ion exchange membrane** comprising an ion exchange resin and a binder polymer, wherein the binder polymer is a polymer containing at least a mixture comprising low density polyethylene and ethylene-propylene rubber or ethylene-propylene-diene rubber.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L4 ANSWER 12 OF 23 USPATFULL on STN
ACCESSION NUMBER: 1998:91464 USPATFULL
TITLE: Electrochemically assisted ion exchange
INVENTOR(S): Nyberg, Eric D., Belmont, CA, United States
PATENT ASSIGNEE(S): Pionetics Corporation, Mountain View, CA, United States (U.S. corporation)

| | NUMBER | KIND | DATE |
|---|---|---|---|
| PATENT INFORMATION: | US 5788826 | | 19980804 |
| APPLICATION INFO.: | US 1997-790710 | | 19970128 (8) |

DOCUMENT TYPE: Utility
FILE SEGMENT: Granted
PRIMARY EXAMINER: Phasge, Arun S.
LEGAL REPRESENTATIVE: Janah, Ashok K.
NUMBER OF CLAIMS: 57
EXEMPLARY CLAIM: 1
NUMBER OF DRAWINGS: 11 Drawing Figure(s); 9 Drawing Page(s)
LINE COUNT: 1990
CAS INDEXING IS AVAILABLE FOR THIS PATENT.
AB A electrochemical cell for removing ions from a solution stream comprises a housing having first and second electrodes. At least one water-splitting **ion exchange membrane** is positioned between the electrodes, the water-splitting membrane comprising (i) a cation exchange surface facing the first electrode, and (ii) an anion exchange surface facing the second electrode. A solution stream pathway is defined by the water-splitting membrane. The solution stream pathway comprises (i) an inlet for influent solution stream, (ii) at least one channel that allows influent solution stream to flow past at least one surface of the water-splitting membrane to form one or more treated solution streams, and (iii) a single outlet that combines the treated solution streams to form a single effluent solution. Preferably, the solution stream pathway comprises a unitary and contiguous channel that flows past both the cation and anion exchange surfaces of the

water-splitting membrane, and more preferably is connected throughout in an unbroken sequence and extends substantially continuously from the inlet to the outlet.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L4 ANSWER 13 OF 23 USPATFULL on STN

| | |
|---|---|
| ACCESSION NUMBER: | 94:80008 USPATFULL |
| TITLE: | **Heterogeneous ion exchange materials** comprising polyethylene of linear low density or high density high molecular weight |
| INVENTOR(S): | Giuffrida, Anthony, North Andover, MA, United States |
| PATENT ASSIGNEE(S): | IP Holding Company, Wilmington, DE, United States (U.S. corporation) |

| | NUMBER | KIND | DATE | |
|---|---|---|---|---|
| PATENT INFORMATION: | US 5346924 | | 19940913 | |
| APPLICATION INFO.: | US 1992-949707 | | 19920923 | (7) |

| | |
|---|---|
| DOCUMENT TYPE: | Utility |
| FILE SEGMENT: | Granted |
| PRIMARY EXAMINER: | Zitomer, Fred |
| LEGAL REPRESENTATIVE: | Wolf, Greenfield & Sacks |
| NUMBER OF CLAIMS: | 18 |
| EXEMPLARY CLAIM: | 1 |
| LINE COUNT: | 722 |

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

AB A novel, **heterogeneous ion exchange membrane**, methods for making such a membrane, and devices containing such a membrane are disclosed. Such membranes comprise linear low or linear medium density polyethylene or high molecular weight high density **polyethylene** as a **binder** and can incorporate a wide variety of ion exchange resin materials. The membranes can be fabricated using extrusion or other melt processing procedures to produce a product, which upon conditioning in water, exhibits properties adapted for use in numerous applications.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L4 ANSWER 14 OF 23 USPAT2 on STN

| | |
|---|---|
| ACCESSION NUMBER: | 2002:78793 USPAT2 |
| TITLE: | Heterogeneous anion exchanger |
| INVENTOR(S): | Sugaya, Yoshio, Yokohama, JAPAN |
| PATENT ASSIGNEE(S): | Asahi Glass Company, Limited, Tokyo, JAPAN (non-U.S. corporation) |

| | NUMBER | KIND | DATE | |
|---|---|---|---|---|
| PATENT INFORMATION: | US 6632848 | B2 | 20031014 | |
| APPLICATION INFO.: | US 2001-909904 | | 20010723 | (9) |

| | NUMBER | DATE |
|---|---|---|
| PRIORITY INFORMATION: | JP 2000-221831 | 20000724 |

| | |
|---|---|
| DOCUMENT TYPE: | Utility |
| FILE SEGMENT: | GRANTED |
| PRIMARY EXAMINER: | Zitomer, Fred |
| LEGAL REPRESENTATIVE: | Oblon, Spivak, McClelland, Maier & Neustadt, P.C. |
| NUMBER OF CLAIMS: | 11 |
| EXEMPLARY CLAIM: | 1 |
| NUMBER OF DRAWINGS: | 0 Drawing Figure(s); 0 Drawing Page(s) |
| LINE COUNT: | 540 |

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

AB A heterogeneous anion exchanger comprising from 35 to 85 mass % of an anion exchange resin and from 15 to 65 mass % of a binder polymer, wherein the anion exchange resin is made of a polymer having repeating units represented by the following formula (1): ##STR1##

wherein R is a C.sub.3-8 alkylene group or an alkyleneoxyalkyl group having a total carbon number of from 4 to 9, R.sup.1 is a C.sub.1-4 alkyl group which may be substituted by a hydroxyl group, each of R.sup.2 and R.sup.3 is a C.sub.1-4 alkyl group, and X.sup.- is an anion, and wherein any hydrogen atom bonded to the benzene ring may be substituted by an alkyl group or a halogen atom.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L4 ANSWER 15 OF 23 CAPLUS COPYRIGHT 2003 ACS on STN
ACCESSION NUMBER: 2000:911336 CAPLUS
DOCUMENT NUMBER: 134:57748
TITLE: **Heterogeneous ion-exchange membrane** and its manufacture
INVENTOR(S): Towe, Ian Glenn; Yagar, Mathew J.
PATENT ASSIGNEE(S): E-Cell Corporation, Can.
SOURCE: PCT Int. Appl., 17 pp.
CODEN: PIXXD2
DOCUMENT TYPE: Patent
LANGUAGE: English
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

| PATENT NO. | KIND | DATE | APPLICATION NO. | DATE |
|---|---|---|---|---|
| WO 2000078849 | A1 | 20001228 | WO 2000-CA741 | 20000621 |
| W: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM | | | | |
| RW: GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW, AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG | | | | |
| EP 1203049 | A1 | 20020508 | EP 2000-940094 | 20000621 |
| R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO, MK, CY, AL | | | | |
| US 2002128334 | A1 | 20020912 | US 2001-24255 | 20011221 |

PRIORITY APPLN. INFO.: CA 1999-2275999 A 19990621
WO 2000-CA741 W 20000621

AB A **heterogeneous ion-exchange material** comprises an ion-exchange resin incorporated within a binder which comprises a material selected from (i) a metallocene-catalyzed linear low-d. polyethylene, (ii) a very low-d. polyethylene or ultra low-d. polyethylene produced using either Ziegler-Natta catalysts or metallocene catalysts, (iii) a thermoplastic olefin elastomeric material comprising a polypropylene continuous phase with a rubbery phase of ethylene-propylene-diene rubber or ethylene-propylene rubber dispersed through the polypropylene continuous phase, and (iv) a thermoplastic vulcanizate comprising a polypropylene continuous phase with an ethylene-propylene-diene rubber, ethylene-propylene rubber, nitrile-butadiene rubber, natural rubber, ethylene-vinyl acetate rubbery phase dispersed through the polypropylene continuous phase, a copolymer of vinylidene fluoride and hexafluoropropylene, or a copolymer of vinylidene fluoride, hexafluoropropylene, and tetrafluoroethylene. The **ion**

-**exchange membrane** can be manufd. using advanced extrusion techniques, including computer-controlled material feed, computer-controlled automatic die thickness adjustment with independently adjustable lip segments and nuclear gauge detection with feed-back control.
REFERENCE COUNT: 11 THERE ARE 11 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L4 ANSWER 16 OF 23 CAPLUS COPYRIGHT 2003 ACS on STN
ACCESSION NUMBER: 1998:102668 CAPLUS
DOCUMENT NUMBER: 128:168397
TITLE: Polyolefin-based **heterogeneous ion exchange membranes**
INVENTOR(S): Terada, Ichiro; Kiguchi, Yoshiaki; Miyake, Haruhisa; Umemura, Kazuo
PATENT ASSIGNEE(S): Asahi Glass Co., Ltd., Japan
SOURCE: Jpn. Kokai Tokkyo Koho, 5 pp.
CODEN: JKXXAF
DOCUMENT TYPE: Patent
LANGUAGE: Japanese
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

| PATENT NO. | KIND | DATE | APPLICATION NO. | DATE |
|---|---|---|---|---|
| JP 10036530 | A2 | 19980210 | JP 1996-194196 | 19960724 |
| EP 821024 | A2 | 19980128 | EP 1997-112654 | 19970723 |
| EP 821024 | A3 | 19981007 | | |
| EP 821024 | B1 | 20020612 | | |
| R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, FI | | | | |
| US 5948826 | A | 19990907 | US 1997-898957 | 19970723 |
| AT 219121 | E | 20020615 | AT 1997-112654 | 19970723 |

PRIORITY APPLN. INFO.: JP 1996-194196 A 19960724
AB The title membranes, with low elec. resistivity and high mech. strength, are prepd. from ion exchange resins (e.g., Diaion SK-1B, Diaion SA-10A) and binder polymers contg. LDPE and EPR or EPDM.

L4 ANSWER 17 OF 23 CAPLUS COPYRIGHT 2003 ACS on STN
ACCESSION NUMBER: 1997:59930 CAPLUS
DOCUMENT NUMBER: 126:90074
TITLE: Preparation and characteristics of **heterogeneous cation exchange membrane**: 1. Mixing ratio of matrix and ion exchange resin
AUTHOR(S): Yang, Hyun S.; Cho, Byoung H.; Kang, Bong K.; Lee, Tae W.
CORPORATE SOURCE: Dept. Industrial Chem., Chungnam Nat'l Univ., Taejon, 305-764, S. Korea
SOURCE: Kongop Hwahak (1996), 7(6), 1132-1141
CODEN: KOHWE9; ISSN: 1225-0112
PUBLISHER: Korean Society of Industrial and Engineering Chemistry
DOCUMENT TYPE: Journal
LANGUAGE: Korean
AB **Heterogeneous cation exchange membrane** (HCEM) was prepd. with LLDPE (linear low-d. **polyethylene**) as **binder**, powd. cation exchange resins (diam. .ltoreq. 149.mu.m) as **ion-exchange material** and glycerol as additive for electrodialysis and electrodeionization system. The wt. ratio of (binder/ion exchange)/glycerol was (60%/40%)/5%, (55%/45%)/5%, (50%/50%)/5% and (40%/60%)/5%. The characterization of prepd. HCEM was evaluated on mech.,

electrochem., morphol. and ion permeable properties. Electrochem. properties of HCEM of (50%/50%)/5% were very similar to value of IONPURE (com. membrane), in which ion exchange capacity, ion transfer no. and membrane resistance were to be 1.733 meq/g, 0.96 and 16.08 .OMEGA./cm2, resp. Ion permeability of the membrane was better than that of IONPURE membrane. Compared with IONPURE membrane, the HCEM had a higher tensile strength and lower elongation and modulus, in which HCEM had tensile strength of 62.33 kg/cm2, elongation of 87.42% and modulus of 658.53 kg/cm2. The HCEM of (50%/50%)/5% was optimum combination.

L4 ANSWER 18 OF 23 CAPLUS COPYRIGHT 2003 ACS on STN
ACCESSION NUMBER: 1995:308608 CAPLUS
DOCUMENT NUMBER: 122:57724
TITLE: **Heterogeneous** ethylene polymer-based **ion exchange membrane**, methods for making such a membrane, and devices
INVENTOR(S): Giuffrida, Anthony
PATENT ASSIGNEE(S): Ionpure Technologies Corp., USA
SOURCE: PCT Int. Appl., 30 pp.
CODEN: PIXXD2
DOCUMENT TYPE: Patent
LANGUAGE: English
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

| PATENT NO. | KIND | DATE | APPLICATION NO. | DATE |
|---|---|---|---|---|
| WO 9406850 | A1 | 19940331 | WO 1993-US8745 | 19930916 |
| W: JP | | | | |
| RW: AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE | | | | |
| US 5346924 | A | 19940913 | US 1992-949707 | 19920923 |
| EP 662099 | A1 | 19950712 | EP 1993-921620 | 19930916 |
| EP 662099 | B1 | 19981111 | | |
| R: DE, FR, GB | | | | |
| JP 08504224 | T2 | 19960507 | JP 1993-508304 | 19930916 |

PRIORITY APPLN. INFO.: US 1992-949707 A 19920923
WO 1993-US8745 W 19930916

AB Such membranes with pliability and free of cracks comprise linear low or linear medium d. polyethylene or high mol. wt. high d. **polyethylene** as a **binder** and can incorporate a wide variety of ion exchange resin materials. The membranes can be fabricated using extrusion or other melt processing procedures to produce a product, which upon conditioning in H2O, exhibits properties adapted for use in numerous applications.

L4 ANSWER 19 OF 23 CAPLUS COPYRIGHT 2003 ACS on STN
ACCESSION NUMBER: 1985:407396 CAPLUS
DOCUMENT NUMBER: 103:7396
TITLE: Evaluation of the chemical stability of heterogeneous membranes
AUTHOR(S): Klimova, Z. V.; Saldadze, G. K.
CORPORATE SOURCE: USSR
SOURCE: Zhurnal Prikladnoi Khimii (Sankt-Peterburg, Russian Federation) (1985), 58(3), 524-8
CODEN: ZPKHAB; ISSN: 0044-4618
DOCUMENT TYPE: Journal
LANGUAGE: Russian

AB The chem. resistance and mech. strength of **heterogeneous ion-exchange membranes** contg. 55-65% high-d. **polyethylene** (I) [9002-88-4] as a **binder** and Lavsan or Kapron fibers as reinforcement were detd. The mech. properties of the membrane deteriorated with decreasing I content and were significantly

affected by the nature of reinforcing fabrics. The stability of membranes reinforced with Kapron fabrics was most deteriorated in HNO3. The chem. resistance of I and reinforcing fabrics was lower than that of ion exchange resins.

L4 ANSWER 20 OF 23 CAPLUS COPYRIGHT 2003 ACS on STN
ACCESSION NUMBER: 1979:169379 CAPLUS
DOCUMENT NUMBER: 90:169379
TITLE: **Heterogeneous anion-exchange membranes** based on an oligomer of epichlorohydrin and different amines
AUTHOR(S): Ergozhin, E. E.; Chukenova, T.; Menligaziev, E. Zh.
CORPORATE SOURCE: Inst. Khim. Nauk, Alma-Ata, USSR
SOURCE: Izvestiya Akademii Nauk Kazakhskoi SSR, Seriya Khimicheskaya (1979), 29(1), 69-71
CODEN: IKAKAK; ISSN: 0002-3205
DOCUMENT TYPE: Journal
LANGUAGE: Russian
AB Anion exchangers based on reaction products of epichlorohydrin polymer with di- and polyamines form, on mixing with high-d. **polyethylene** solns. as **binders, anion-exchange membranes** which have an ion exchange capacity 3.2-5.1 mequiv/g and sp. resistivity 80-200 .OMEGA.-cm. An increase in the ion exchange component-binder ratio from 40:60 to 80:20 wt.% increased the ion exchange capacity and water permeability of the membrane from 4.0 to 5.7 mequiv/g and from 48.5 to 68.7%, resp. and decreased the resistivity from 573 to 5.0 .OMEGA.-cm. An increase in the mixing time gradually decreased the sp. resistivity of the membranes due to a homogenization of the original mixt. The optimum conditions for prepn. of the membranes were anion exchanger-binder ratio 70-30 and temp. and time of mixing 110.degree. and 10-15 min, resp., for membranes prepd. from polyepichlorohydrin reaction products with polyethylenepolyamine, polyxylylenepolyamine, and hexamethylenediamine.

L4 ANSWER 21 OF 23 CAPLUS COPYRIGHT 2003 ACS on STN
ACCESSION NUMBER: 1972:141582 CAPLUS
DOCUMENT NUMBER: 76:141582
TITLE: Production and properties of **heterogeneous ion-exchange membranes**
AUTHOR(S): Tulupov, P. E.; Zhukov, M. A.; Kossaya, A. M.; Pashkov, A. B.; Greben, V. P.; Kostyukhina, L. I.
CORPORATE SOURCE: USSR
SOURCE: Plasticheskie Massy (1972), (2), 60-2
CODEN: PLMSAI; ISSN: 0554-2901
DOCUMENT TYPE: Journal
LANGUAGE: Russian
AB **Heterogeneous ion exchange membranes** were manufd. by molding finely-divided KU-2 [11098-94-5], AV-17 [11106-27-7], or EDE-10P [11106-30-2] resins with powd. high pressure polyethylene [9002-88-4] and reinforcing with Kapron or Lavsan fabrics. Lavsan-reinforced membranes had good mech. strength and elasticity and performed well at 100.deg.. The elec. cond. of the membrane was an exponential function of the ion exchange capacity.

L4 ANSWER 22 OF 23 CAPLUS COPYRIGHT 2003 ACS on STN
ACCESSION NUMBER: 1972:100461 CAPLUS
DOCUMENT NUMBER: 76:100461
TITLE: Heterogeneous membranes based on furan resins
AUTHOR(S): Fatkhullaev, E.; Nazirova, R. A.; Dzhalilov, A. T.; Neudakhina, A. N.
CORPORATE SOURCE: Tashk. Politekh. Inst., Tashkent, USSR
SOURCE: Uzbekskii Khimicheskii Zhurnal (1971), 15(4), 58-60

CODEN: UZKZAC
DOCUMENT TYPE: Journal
LANGUAGE: Russian
AB **Heterogeneous ion exchange membranes** were prepd. by a 3-stage procedure from low and high pressure **polyethylene** [9002-88-4] and PVC [9002-86-2] **binders** and ion exchange resins [prepd. by polycondensation of p-toluenesulfonic acid [104-15-4], .beta.-naphthalenesulfonic acid [120-18-3], or salicylic acid [69-72-7] with furfural (I) [98-01-1], or by polycondensation of polyethylene polyamine, I, and hydrofuramide [494-47-3]]. The membranes were 0.38-0.50 mm thick and had good physicochem. properties and elec. properties.

L4 ANSWER 23 OF 23 CAPLUS COPYRIGHT 2003 ACS on STN
ACCESSION NUMBER: 1968:510167 CAPLUS
DOCUMENT NUMBER: 69:110167
TITLE: Change in the properties of **ion-exchange membranes** used for obtainingg acids and alkalies from salt solutions by electrodialysis
AUTHOR(S): Rauzen, F. V.; Dudnik, S. S.; Zhukov, M. A.
CORPORATE SOURCE: USSR
SOURCE: Zhurnal Prikladnoi Khimii (Sankt-Peterburg, Russian Federation) (1968), 41(8), 1758-61
CODEN: ZPKHAB; ISSN: 0044-4618
DOCUMENT TYPE: Journal
LANGUAGE: Russian
AB **Heterogeneous** cation and **anion exchange membranes** were prepd. from the resp. resins KU-2 and EDE-10P with **polyethylene** as the inert **binding** material. The membranes were used to sep. the cathodic and anodic compartments from the middle one in an exptl. electrodialysis cell. A NaNO3 soln. was fed into the middle compartment, while NaOH and HNO3 were introduced into the cathodic and anodic compartments, resp. The dependence of the current efficiency on the soln. concns. c.ds. of the membranes, time, and duration of membrane use were studied. The membrane selectivity was detd. by following the amts. of NO3- and Na+ penetrated into catholyte and anolyte, resp. The current efficiency decreased with increasing concns. of HNO3 and NaOH, with higher c.ds. on the membranes, higher temps., and with the age of the membranes. Also the membrane selectivity, although high initially, decreased with the duration of voltage application. Their useful life was 150 hrs. at c.ds. 20-30 ma./cm.2 and .apprx.300 hrs. at 10 ma./cm.2, provided that the HNO3 and NaOH concns. were a max. of 1N. Preliminary expts. were made with newly prepd. membranes capable of withstanding long-time use at a c.d. of 80 ma./cm.2

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L4 ANSWER 1 OF 23 USPATFULL on STN
ACCESSION NUMBER: 2003:146871 USPATFULL
TITLE: Methods and apparatus for the formation of **heterogeneous ion-exchange membranes**
INVENTOR(S): Bernatowicz, Joseph M., Langhorne, PA, UNITED STATES
Snow, Michael J., Rancho Santa Fe, CA, UNITED STATES
O'Hare, Ronald J., South Laguna, CA, UNITED STATES

| | NUMBER | KIND | DATE | |
|---|---|---|---|---|
| PATENT INFORMATION: | US 2003100618 | A1 | 20030529 | |
| APPLICATION INFO.: | US 2003-336298 | A1 | 20030103 | (10) |

RELATED APPLN. INFO.: Division of Ser. No. US 1999-444055, filed on 19 Nov 1999, GRANTED, Pat. No. US 6503957
DOCUMENT TYPE: Utility
FILE SEGMENT: APPLICATION
LEGAL REPRESENTATIVE: Frank Frisenda, Jr., Suite 470, 3993 Howard Hughes Parkway, Las Vegas, NV, 89109
NUMBER OF CLAIMS: 17
EXEMPLARY CLAIM: 1
NUMBER OF DRAWINGS: 1 Drawing Page(s)
LINE COUNT: 608
CAS INDEXING IS AVAILABLE FOR THIS PATENT.

TI Methods and apparatus for the formation of **heterogeneous ion-exchange membranes**

AB The present invention provides methods and apparatus for the formation of **heterogeneous ion-exchange membranes** by prescribed in-line compounding and extrusion of a polymeric binder and heat sensitive ion-exchange resin. The ion-exchange resin is incorporated, at a late process stage, into the melted matrix polymer at relatively low temperature and residence time prior to transfer to a die head for extrusion. In the presently preferred embodiment, the in-line compounding apparatus comprises a twin-screw compounding extruder, for effecting late stage kneading and mixing of ion-exchange resin and optional additives to the polymer melt, prior to compression to transfer the blended polymer melt to a die head for extrusion. Accordingly, the final properties of the resultant **heterogeneous ion-exchange membrane** are enhanced as the blended polymer melt material is not exposed to excessive heat and shear history. Resultant **heterogeneous ion-exchange membranes** and apparatus for treatment of fluid streams utilizing such membranes are also provided.

SUMM [0002] The present invention provides unique **heterogeneous ion-exchange membranes**, methods and apparatus for producing such membranes, and ion-removing apparatus utilizing such membranes.

SUMM [0006] Typically, in electrodeionization, a number of flat sheets of alternating cation and **anion exchange membranes** are placed between two electrodes with mixed bed of ion-exchange resins alternately added between the membranes.

SUMM [0013] A critical element of such purification devices is the membrane that selectively allows diffusion and adsorption of ions while excluding certain other ions and non-ionized solutes and solvents. These membranes have commonly been referred to as **ion-exchange membranes** and are used in a wide variety of devices for fractionation, transport depletion and electro-regeneration, purification for treatment of water, food, beverages, chemicals and waste streams. Such membranes are also used in electrochemical devices and electrophoresis as well as analytical equipment and for treatment applications.

SUMM [0014] Commercially available **ion-exchange membranes** are generally classified as two types: homogeneous membranes and heterogeneous membranes. A homogeneous membrane is one in which the entire volume of the membrane (excluding any support material that may be used to improve strength) is made from the reactive polymer. Heterogeneous membranes, on the other hand, are formed of a composite containing an ion-exchange resin to impart electrochemical properties and a binder to impart physical strength and integrity.

SUMM [0020] U.S. Pat. No. 5,346,924 to Giuffrida discloses a **heterogeneous ion-exchange membrane**

using a **binder** comprising a linear low density **polyethylene** (LLDPE) or a high molecular weight high density polyethylene (HMWHDPE) and methods for making the same. The membrane is fabricated from granules or pellets of ion-exchange resin and either LLDPE or HMWHDPE binder that are used as a raw material in a thermoplastic extrusion process, a heat pressing process, or another, similar process employing pressure and heat to create a dry composite sheet of constant width and thickness or having other controlled, formed dimensions. Membrane sheets formed by such processes are then conditioned and activated using a water treatment.

SUMM [0021] Conventionally, **heterogeneous ion-exchange membranes** are fabricated by providing granulated or powdered polymer binder to a mixer and heating until the material becomes molten. Ion-exchange resins are then added in powder form and the resulting composition is then mixed to evenly distribute the ion-exchange resins throughout the melt. The molten cast mixture may then be cast or alternatively sent to an extruder.

SUMM [0023] Kojima, et al., in U.S. Pat. No. 3,627,703 discloses a polypropylene resin composite which comprises a polypropylene resin matrix that is both microscopically foamed and molecularly oriented in three dimensions and ion-exchanging material dispersed therein. In one embodiment, the composite is produced by a process which comprises subjecting a precursor composite comprising a solid polypropylene matrix and an **ion-exchange material** of greater swellability to a chemical treatment comprising an acid and an alkali treatment. In one embodied form, the polypropylene resin and **ion-exchange material** by kneading at a temperature above the melting point of the polyproplylene resin. Subsequent to kneading at high temperature, the mixture is thereafter formed or molded and thereafter chemically treated.

SUMM [0024] While recognizing the virtues of polypropylene as a binder, Kojima, et al., in U.S. Pat. No. 3,627,703 discloses a fabrication process for **ion-exchange membrane** exposing the resinous material to multiple meltings and temperature cycles.

SUMM [0025] Accordingly those skilled in the art have recognized a significant need for an efficient process for the fabrication of **heterogeneous ion-exchange membranes** that accurately controls processing parameters to preserve the active ion sites and other desired characteristics of the incorporated resinous material while at the same time, providing an **heterogeneous ion-exchange membrane** with the structural integrity required for demanding environment such as electrodeionization. The present invention fulfills these needs.

SUMM [0026] The present invention provides unique methods and apparatus for the formation of **heterogeneous ion-exchange membranes** by prescribed in-line compounding and extrusion of a polymeric binder and heat sensitive ion-exchange resin. The ion-exchange resin is incorporated, at a late process stage, into the melted matrix polymer at relatively low temperature and residence time prior to transfer to a die head for extrusion. In the presently preferred embodiment, the in-line compounding apparatus comprises a twin screw compounding extruder, for effecting late stage kneading and mixing of ion-exchange resin and optional additives to the polymer melt, prior to compression to transfer the blended polymer melt to a die head for extrusion. Accordingly, the final properties of the resultant **heterogeneous ion-exchange membrane** are enhanced as the blended polymer melt material is not exposed to

excessive heat and shear history. Resultant **heterogeneous ion-exchange membranes** and apparatus for treatment of fluid streams utilizing such membranes is also provided.

SUMM [0032] e) transporting the blended, melted polymer matrix derived from step d) to a die head for extrusion to form a **heterogeneous ion-exchange membrane**.

SUMM [0037] The ion-exchange resin to be dispersed in the polymer binder, may be any **ion-exchange material** which is anionic, cationic, amphoteric, or another ionic type may be used. Preferably, ion-exchange resins which are stable at the melting point range of the preferred polypropylene resins are used for preparing the blended polymer matrix.

SUMM [0038] Accordingly, the **heterogeneous ion-exchange membranes** in accordance with the present invention are particular useful for fabrication of electrodeionization modules. The inventive methods provide an efficient and cost effective process for formation of such membranes that exhibit enhanced properties because the resinous **ion-exchange material** is not exposed to excessive heat and shear history.

DETD [0040] The present invention provides unique methods and apparatus for the formation of **heterogeneous ion-exchange membranes** by prescribed in-line compounding and extrusion of a polymeric binder and heat sensitive ion-exchange resin. The ion-exchange resin is incorporated, at a late process stage, into the melted matrix polymer at relatively low temperature and short residence time prior to transfer to a sheet die head for extrusion.

DETD [0041] Accordingly, the final properties of the resultant **heterogeneous ion-exchange membrane** are enhanced as the blended polymer melt material is not exposed to excessive heat and shear history.

DETD [0053] e) compressing and conveying the blended melt derived from step d) directly to a sheet die head for extrusion to form a **heterogeneous ion-exchange membrane** .

DETD [0056] The **ion-exchange material** to be dispersed in the composite, may be any ion-exchanging material which is anionic, cationic, amphoteric, or another ionic type may be used.

DETD [0065] Preferably the powdered **ion-exchange material** which is sized to smaller than 100 mesh, or preferably sized to smaller than 32 mesh, is added to the melted matrix polymer through means of a side stuffer to enter a second kneading and mixing zone. The second mixing zone is provided with a side feed entry port that introduces the powdered additive to the melted matrix polymer, i.e., homogeneous polypropylene polymer. The second kneading and mixing zone is maintained at a temperature above the melting point of the polypropylene with atmospheric venting. Thereafter, the blended melted polymer matrix and **ion-exchange material** is fed to a third kneading and mixing zone where extrusion agents may be added. Typically, such extrusion agents comprise glycerine and the like to facilitate further processing transfer and extrusion through the die head. The third kneading and mixing zone is preferably maintained under-vacuum conditions for degassing and the melted mixture is thereafter transferred through a compressional section to the die head.

DETD [0066] The unique **heterogeneous** polypropylene **ion-exchange membranes** in accordance with the present invention were thus formed by a twin-screw compounding extruder. In this respect, the twin-screw extruder continuously mixes, devolatilizes and processes the metallocene polypropylene binder through prescribed

compounding with the resinous material by relatively small shear and extentional forces. Accordingly, the traditional pelletizing step and remelting is bypassed avoiding excessive heat and shear history.

DETD [0068] FIG. 1 illustrates a schematic block diagram of a presently preferred embodiment of the inventive in-line compounding apparatus in accordance with the present invention. As shown in FIG. 1, the supply of polymer binder is fed, for instance, by a gravity feed device 10 to the first zone 12 within the extrusion system. A second zone 14 effects melting of the polymer binder within the extruder at a temperature range of between about the softening point of the polymer binder and the melting point of the polymer binder to form a melted matrix polymer. In a third zone 16, the melted matrix polymer is kneaded to form a homogeneous matrix. In a fourth zone 18, optional additives may be supplied to the polymer matrix, for instance, conventional extrusion agents such as glycerine to enhance the malleability of the homogenous matrix. By separate gravity feed device 20, powdered ion-exchange resin is added to the melted matrix polymer in the fifth zone 22 and the blended matrix is further mixed and kneaded before degassing in the sixth zone 24. In a seventh zone 26, the blended, melted polymer matrix is compressed and fed to a sheet die head 28 for extrusion to form a **heterogeneous ion-exchange membrane**

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DETD [0069] A **heterogeneous** polypropylene **ion-exchange membrane** was produced by feeding a supply of metallocene propylene polymer to a twin-screw compounding extruder, said extruder having a first feed zone, a second melting zone, a third zone for kneading melt homogeneity, a feed entry port disposed down stream of the third zone, a fourth zone for effecting further kneading and mixing of additives to the preferred polymer melt, a fifth zone for mixing extrusion agents within the blended polymer melt a sixth zone for degassing and a seventh compression zone to transfer the blended polymer melt to a sheet die head for extrusion. The binder was maintained within a polymer melt section of the extruder at a temperature below about 130 degrees C. to melt said binder and to knead to form a homogeneous melt. The kneaded melted matrix polymer was thereafter transported to an intermediate mixing zone and powdered ion-exchange resin was added to the melted matrix polymer with subsequent kneading and mixing the melted matrix polymer with the **ion-exchange material** at a temperature below about 130 degrees C. at atmospheric pressure. The blended, melted polymer matrix was then transported to a compression zone of the extruder. The blended, melted polymer matrix was thereafter transported from said compression zone to a sheet die head for extrusion to form a membrane having an extruded thickness of approximately 0.001 inches to about 0.050 inches.

DETD [0071] Typically, the residence time of the **ion-exchange material** in the extrusion system will be under two minutes and preferably less than thirty seconds.

DETD [0072] Accordingly, the present invention provides an apparatus for the formation of a **heterogeneous ion-exchange membrane** comprising in a single machine: a twin-screw compounding extruder, said extruder having a first feed zone, a second melting zone, a third zone for kneading melt homogeneity, means for feeding selective additives to the polymer melt downstream of said third zone, a fourth zone for effecting the kneading and mixing of additives to the preferred polymer melt, a fifth zone for mixing extrusion agents within the blended polymer melt, which may be placed anywhere after said zone three, a sixth compression zone for degassing the blended polymer melt, and a seventh compression zone to transfer the blended polymer melt to an attached sheet die head; in addition, an adjustable sheet die head for extruding thin melted sheet membrane, a roll stack for forming, cooling and calendaring the membrane, and a membrane take-up device; wherein the residence time of the **ion-exchange**

**material** is kept to a minimum while at elevated temperatures, ideally less than two minutes, and a preferably to less than one minute.

CLM What is claimed is:

1. A method for the formation of a **heterogeneous ion -exchange membrane** comprising: a) feeding a supply of propylene binder to a inline compounding extruder, having means for melting, kneading and transferring the polymer binder to a sheet die head for extrusion; said extruder further having means for feeding and blending active additives in-line to the melted polymer binder at a prescribed processing stage; b) maintaining the polymer binder within said extruder at a temperature range of between about the softening point of said polymer binder and the melting point of said polymer binder to form a melted matrix polymer; c) kneading the melted matrix polymer to form a homogeneous matrix; d) subsequently adding and mixing a powdered ion-exchange resin, to the melted matrix polymer derived from step c) to form a homogenous blended melt within said extruder during a relatively limited residence time; and e) transporting the blended melted polymer matrix derived from step d) directly to a sheet die head for extrusion to form a **heterogeneous ion-exchange membrane**.

2. The method for the formation of a **heterogeneous ion -exchange membrane** as defined in claim 1, wherein said powdered ion-exchange resin is added to the melted matrix polymer in a range of between about 20% to about 80% by weight.

3. The method for the formation of a **heterogeneous ion -exchange membrane** as defined in claim 1, wherein the polymer binder is polypropylene polymer.

4. The method for the formation of a **heterogeneous ion -exchange membrane** as defined in claim 1, wherein the powdered ion-exchange resin has an average size of 200 mesh.

5. The method for the formation of a **heterogeneous ion -exchange membrane** as defined in claim 1, wherein polymer binder is metallocene polypropylene polymer having a narrow molecular weight distribution and having a melting point below about 130 degrees C.

6. The method for the formation of a **heterogeneous ion -exchange membrane** as defined in claim 1, wherein the powdered ion-exchange resin has an average size of 325 mesh.

7. The method for the formation of a **heterogeneous ion -exchange membrane** as defined in claim 1, wherein the powdered ion-exchange resin is of Type I.

8. The method for the formation of a **heterogeneous ion -exchange membrane** as defined in claim 1, wherein the powdered ion-exchange resin is of Type II.

9. The method for the formation of a **heterogeneous ion -exchange membrane** as defined in claim 1, wherein the powdered ion-exchange resin is of Type III.

10. The method for the formation of a **heterogeneous ion-exchange membrane** as defined in claim 1, wherein the powdered ion-exchange resin is anionic.

11. The method for the formation of a **heterogeneous ion-exchange membrane** as defined in claim 1,

wherein the powdered ion-exchange resin is cationic.

12. The method for the formation of a **heterogeneous ion-exchange membrane** as defined in claim 1, wherein the powdered ion-exchange resin is amphoteric.

13. The method for the formation of a **heterogeneous ion-exchange membrane** as defined in claim 1, wherein the powdered ion-exchange resin is a mixture of **ion-exchange materials** selected from the group consisting of: Type I, Type II, Type III, anionic, cationic, amphoteric and mixtures thereof.

14. A **heterogeneous ion-exchange membrane** formed by the process defined in claim 1.

15. The **heterogeneous ion-exchange membrane** as defined in claim 14 having a thickness within a range of from about 0.001 inches to about 0.05 inches.

16. The **heterogeneous ion-exchange membrane** as defined in claim 14 having a thickness within a range of from about 0.005 inches to about 0.020 inches.

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L4 ANSWER 7 OF 23 USPATFULL on STN

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| ACCESSION NUMBER: | 2001:67051 USPATFULL |
| TITLE: | Method and apparatus for producing deionized water |
| INVENTOR(S): | Terada, Ichiro, Yokohama, Japan<br>Toda, Hiroshi, Ichihara, Japan<br>Iwamoto, Junjiro, Yokohama, Japan<br>Umemura, Kazuo, Yokohama, Japan<br>Komatsu, Ken, Yokohama, Japan<br>Hoshi, Tohru, Yokohama, Japan<br>Huehnergard, Mark Philip, Guelph, Canada<br>Tessier, David Florian, Guelph, Canada<br>Towe, Ian Glenn, Guelph, Canada |
| PATENT ASSIGNEE(S): | Asahi Glass Company Ltd., Tokyo, Japan (non-U.S. corporation)<br>Glegg Water Conditioning, Incorporated, Guelph, Canada (non-U.S. corporation) |

| | NUMBER | KIND | DATE |
|---|---|---|---|
| PATENT INFORMATION: | US 6228240 | B1 | 20010508 |
| APPLICATION INFO.: | US 1999-338570 | | 19990623 (9) |
| RELATED APPLN. INFO.: | Division of Ser. No. US 952218, now patented, Pat. No. US 5961805 | | |

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| PRIORITY INFORMATION: | JP 1996-64783 | 19960321 |
| | JP 1997-40026 | 19970207 |

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|---|---|
| DOCUMENT TYPE: | Utility |
| FILE SEGMENT: | Granted |
| PRIMARY EXAMINER: | Phasge, Arun S. |
| LEGAL REPRESENTATIVE: | Oblon, Spivak, McClelland, Maier & Neustadt, P.C. |
| NUMBER OF CLAIMS: | 11 |
| EXEMPLARY CLAIM: | 1 |

NUMBER OF DRAWINGS: 6 Drawing Figure(s); 4 Drawing Page(s)
LINE COUNT: 825
CAS INDEXING IS AVAILABLE FOR THIS PATENT.

AB An apparatus for producing deionized water consisting essentially of an electrodialyzer having **cation exchange membranes** and **anion exchange membranes** alternately arranged between a cathode and an anode to form demineralizing compartments and concentrating compartments, and ion exchangers accommodated in the demineralizing compartments, wherein a pressure of from 0.1 to 20 kg/cm.sup.2 is exerted between the ion exchangers accommodated in the demineralizing compartments and the **cation exchange membranes** and **anion exchange membranes** defining the demineralizing compartments.

SUMM As a method for producing deionized water, it is common to employ a method of obtaining deionized water by passing water to be treated through a packed bed of ion exchange resins so that impurity ions are removed as adsorbed on the ion exchange resin. Here, it is common to employ a method of regenerating the ion exchange resin having its adsorbing ability lowered, by means of an acid or alkali. However, such a method has a problem that a waste liquid of the acid or alkali used for the regeneration, is discharged. Therefore, a method for producing deionized water which requires no such regeneration is desired. From such a viewpoint, an attention has been drawn in recent years to a self-regenerating type electrodialytic deionized water producing method wherein ion exchange resins are used in combination with **ion exchange membranes**. This method is a method wherein a mixture of an anion exchange resin and a cation exchange resin is packed in demineralizing compartments of an electrodialyzer having **anion exchange membranes** and **cation exchange membranes** alternately arranged, and while supplying water to be treated to the demineralizing compartments, a voltage is applied to carry out electrodialysis to produce deionized water. In this method, it is common that the ion exchange resins in a wet condition are accommodated in the demineralizing compartments, whereby there have been drawbacks that the contact among the ion exchange resins to one another or between the ion exchange resins and the **ion exchange membranes**, is inadequate, and if it is attempted to increase the thickness of the mineralizing compartments to reduce the effective membrane area, electrical resistance tends to increase.

SUMM It is an object of the present invention to provide a novel apparatus for producing deionized water whereby, in a self-regenerating type electrodialytic deionized water producing apparatus wherein ion exchangers and **ion exchange membranes** are used in combination, the increase of electrical resistance is small even if the thickness of a demineralizing compartment is made thick, and pure water can be constantly obtained over a long period of time without the above-mentioned drawbacks of the prior art, and to provide a method for producing deionized water by using such an apparatus.

SUMM The present invention provides an apparatus for producing deionized water comprising an electrodialyzer having **cation exchange membranes** and **anion exchange membranes** alternately arranged between a cathode and an anode to form demineralizing compartments and concentrating compartments, and ion exchangers accommodated in the demineralizing compartments, wherein a pressure of from 0.1 to 20 kg/cm.sup.2 is exerted between the ion exchangers accommodated in the demineralizing compartments and the **cation exchange membranes** and **anion exchange**

**membranes** defining the demineralizing compartments.

DETD The pressure formed between the ion exchangers accommodated or packed in the demineralizing compartments and the **cation exchange membranes** and **anion exchange membranes** defining the demineralizing compartments, is adjusted within a range of from 0.1 to 20 kg/cm.sup.2. If the pressure is less than 0.1 kg/cm.sup.2, the contact of the ion exchanger particles to one another or between the ion exchangers and the **ion exchange membranes** tends to be inadequate, whereby electrical resistance is likely to increase, or a short path of water to be treated is likely to form and the purity of the resulting water tends to be low, such being undesirable. On the other hand, if the pressure exceeds 20 kg/cm.sup.2, the contact of the ion exchange resin particles to one another or between the ion exchangers and the **ion exchange membranes** will be adequate, but the amount of water treated tends to decrease, and the **ion exchange membranes** used, are likely to be damaged by the pressure. The above pressure is preferably from 0.5 to 10 kg/cm.sup.2, more preferably from 0.8 to 2 kg/cm.sup.2.

DETD In the present invention, the pressure may be formed between the ion exchangers packed in the demineralizing compartments and the **ion exchange membranes** preferably in such a manner that (1) the ion exchangers to be accommodated in the demineralizing compartments are converted to a form having their volume reduced smaller than the volume of their regenerated form and then packed in the demineralizing compartments in an amount such that the volume of the regenerated form of the ion exchanger in a free state would be larger than the volume of the demineralizing compartments, followed by supplying water and conducting an electric current to let the ion exchanger expand to increase the volume thereby to increase the pressure, or (2) the ion exchanger is accommodated in the demineralizing compartments, and then the volume of the demineralizing compartments is mechanically reduced to increase the pressure.

DETD In the above-mentioned method (2) wherein the ion exchangers are packed in the demineralizing compartments, and then the volume of the demineralizing compartments is mechanically reduced to increase the pressure, it is preferred to interpose a spacer which is shrinkable by pressure between demineralizing compartment frames and the **ion exchange membranes**, and exerting pressure from outside to compress the spacer after packing the ion exchangers, so that the volume of the demineralizing compartments is reduced by from 5 to 60 vol %. If the reduced volume of the demineralizing compartments is less than 5 vol %, the contact of the accommodated ion exchangers tend to be poor. On the other hand, if the reduced volume of the demineralizing compartments exceeds 60 vol %, the contact will be good, but the pressure loss when water is passed through the ion exchanger tends to be large, such being undesirable. As the material for such shrinkable spacer, a foam sheet of e.g. polyethylene, polypropylene or polystyrene, is preferably employed.

DETD As the ion exchanger, a cation exchanger, an anion exchanger or a mixture thereof, or a porous formed product thereof, can be employed. The ion exchanger may have a structure in which domains (regions) of a cation exchanger and domains (regions) of an anion exchanger are combined. In such a case, the patterns of the respective domains which are in contact with the **ion exchange membranes**, may be various patterns. For example, a sea-island pattern, a layered pattern, a mosaic pattern or a lattice pattern may be employed. Particularly preferred is a sea-island pattern or a layered pattern, since the ion exchanger with such a pattern can readily be accommodated into the demineralizing compartments, and demineralization can efficiently be carried out. However, the overall proportions of the

cation exchanger and the anion exchanger used are preferably such that the total ion exchange capacity ratio of the cation exchanger/the anion exchanger is within a range of from 20/80 to 80/20.

DETD The thickness of the porous sheet having the ion exchange resin particles bound by the binder polymer, is preferably such that the thickness in a form having the volume reduced for packing into the demineralizing compartment will be from 50 to 100% of the thickness of the demineralizing compartment. If this thickness is less than 50% of the thickness of the demineralizing compartment, the porous sheet will not closely contact with the **ion exchange membranes** when water is supplied and an electric current is conducted, such being undesirable. If the thickness exceeds 100%, such a sheet can not be accommodated in the demineralizing compartment. The thickness of the porous sheet in a form having the volume reduced is particularly preferably from 70 to 90% of the thickness of the demineralizing compartment.

DETD The electrodialyzer comprises an anode compartment provided with an anode and a cathode compartment provided with a cathode, and a plurality of **cation exchange membranes** and **anion exchange membranes** which are alternately arranged between the anode compartment and the cathode compartment preferably via compartment frames to form demineralizing compartments each defined by an **anion exchange membrane** on the anode side and by a **cation exchange membrane** on the cathode side, and concentrating compartments each defined by a **cation exchange membrane** on the anode side and by an **anion exchange membrane** on the cathode side, alternately, preferably in a total number of from 2 to 50 units. The thickness of a picture frame-like compartment frame having an opening at its center, which is present between a **cation exchange membrane** and an **anion exchange membrane**, determines the thickness of the demineralizing compartment or the concentrating compartment. The thicknesses of the compartment frames of the demineralizing compartment and the concentrating compartment may not necessarily be the same. The **ion exchange membranes** may be of a homogeneous type or a heterogeneous type, and in order to increase the mechanical strength, the one reinforced by a woven fabric or a non-woven fabric, may be used. In a concentrating compartment, it is preferred to insert a spacer of a network-form, preferably made of a plastic, in order to maintain the thickness of the concentrating compartment preferably thinner than the thickness of the demineralizing compartment and within a range of preferably from 0.05 to 10 cm. Demineralization can be carried out by conducting an electric current while supplying water to be treated to the demineralizing compartments and supplying water to the concentrating compartments to discharge the concentrated salts. To each unit cell, a voltage of from 4 to 20 V is applied to conduct an electric current preferably at a current density of from 0.00001 to 0.05 A/cm.sup.2.

DETD FIG. 3 is a schematic view illustrating an embodiment of an electrodialyzer of such a type. In FIG. 3, A is an **anion exchange membrane**, and K is a **cation exchange membrane**. As shown, the **anion exchange membranes** A and the **cation exchange membranes** K are arranged in the electrodialyzer 1 via demineralizing compartment frames D1, D2, D3 . . . Dn and concentrating compartment frames C1, C2, C3 . . . Cn at predetermined distances, to form an anode compartment 2, concentrating compartments S1, S2 . . . Sn, demineralizing compartments R1, R2 . . . Rn and a cathode compartment 3. In the demineralizing compartments R1, R2 . . . Rn, anion and cation exchange resins are accommodated or

packed. In the concentrating compartments, spacers N1, N2, N3 . . . Nn are inserted.

DETD In FIG. 3, reference numeral 4 indicates an anode and numeral 5 indicates a cathode, and a predetermined voltage is applied across the two electrodes during the operation, whereby anions in water to be treated which is introduced into the demineralizing compartments R1, R2 . . . Rn from a conduit 6, will permeate and move to a concentrating compartment on the anode side through an **anion exchange membrane** A, while cations in water to be treated will permeate and move to a concentrating compartment on the cathode side through a **cation exchange membrane** K, and water to be treated itself will be deionized and discharged via a conduit 7. Further, water or an aqueous solution is introduced into the respective concentrating compartments S1, S2 . . . Sn from a conduit 8, and the anion and cation components permeated and moved as described above, will be collected and discharged as a concentrated solution from a conduit 9. Cations in the water to be treated, which are captured by the cation exchangers in a demineralizing compartments, will have a driving force given by the electric field, will reach **cation exchange membranes** via cation exchangers which are in contact with the cation exchangers which captured the cations, and further, they will pass through the membranes and move to a concentrating compartments. Likewise, anions in the water to be treated which are captured by the anion exchangers will move to a concentrating compartments via an anion exchangers and an **anion exchange membranes**. Accordingly, it is more preferred that the cation exchanger and the anion exchanger are, respectively, gathered to form domains or gathered regions, whereby contact points of exchanger particles of the same ion type increase remarkably, so that movement of ions is facilitated, and the deionization performance will be improved.

DETD A spherical cation exchange resin (Diaion SK1B, tradename, Mitsubishi Chemical Corporation) having an average diameter of 500 .mu.m and a spherical anion exchange resin (Diaion SA10A, tradename, manufactured by Mitsubishi Chemical Corporation) having an average diameter of 500 .mu.m were mixed in a volume ratio of 50/50 and dried at 50.degree. C. By the drying, the weight of the mixture decreased to 55 wt % of the original weight. As a **binder**, a linear low density **polyethylene** used in Example 2 mentioned below of a pellet form having a diameter of from 2 to 6 mm and a length of from 4 to 9 mm, was added in an amount shown in Table 1 as the amount of the binder to the total amount of the binder and the ion exchange resins, and the mixture was kneaded by a kneader at 140.degree. C. for 40 minutes. This kneaded product was put into a metal mold of a rectangular parallelopiped with an opening side surface of 250 mm.times.150 mm and pressed under a condition of 120.degree. C..times.25 kgw/cm.sup.2 to obtain a porous molded sheet of a rectangular parallelopiped.

DETD One of ion exchangers 1 to 9 was put in a demineralizing compartment 27 of an electrodialyzer having a construction as shown in FIG. 2 and clamped to a prescribed size. The shape of the demineralizing compartment 27 was a rectangular parallelopiped, whereby the length in the water flow direction was 140 mm, the width was 100 mm, and the space between an **anion exchange membrane** 28 and a **cation exchange membrane** 25 was 8 mm. In each of two concentrating compartments 26, a spacer net made of polypropylene was inserted, so that even when the ion exchanger in the demineralizing compartment 27 expanded, the space between the anion and **cation exchange membranes** would not substantially change. Accordingly, also in this demineralizing compartment, the ion exchanger exhibits the same pressure as shown in Table 2. Further, for the purpose of comparison, as ion exchanger 10, a molded product of 111 mm.times.79.4 mm.times.6.3 mm prepared in the same

manner as ion exchangers 1 to 9 and having a binder amount of 2 wt %, was permitted to absorb water adequately and adjusted to have the same size as the demineralizing compartment 27, and such a molded sheet was accommodated in the demineralizing compartment 27.

DETD With ion exchangers 1 to 9, deionized water of a high purity was obtained constantly, and the resistivity was low. Further, such a tendency was observed that with an ion exchanger having a higher pressure shown in Table 2, the properties were better. Whereas, with ion exchanger 10, the purity of deionized water was not high. From the measurement of the pressure loss, it was found that spaces were formed between the ion exchangers and the compartment frames or between the ion exchangers and the **ion exchange membranes,** towards the outlet from the inlet of each demineralizing compartment.

DETD A sulfonic acid type (H-type) cation exchange resin having a particle size of from 400 to 600 .mu.m and an ion exchange capacity of 4.5 meq/g dry resin (Diaion SK-1B, tradename, manufactured by Mitsubishi Chemical Corporation) and a quaternary ammonium salt type (OH-type) anion exchange resin having a particle size of from 400 to 600 .mu.m and an ion exchange capacity of 3.5 meq/g dry resin (Diaion SA-10A, tradename, manufactured by Mitsubishi Chemical Corporation) were subjected to hot air drying at a temperature of 50.degree. C. to bring the water content to 8 wt % and then mixed in a ratio of cation exchange resin/anion exchange resin=44/56 (weight ratio in a dried state) to obtain a mixture having an ion exchange capacity ratio of 50/50. This dried ion exchange resin mixture was packed into each demineralizing compartment of an electrodialyzer wherein the thickness of the demineralizing compartment was 1.2 cm and the thickness of a concentrating compartment having a spacer net made of polypropylene (thickness: 0.2 cm) was 0.2 cm, to a volume packing ratio of 60%. After supplying water for 60 minutes and electric current conducting pretreatment for 24 hours, the resistivity in water with 10 .mu.S/cm was measured and found to be 1051 .OMEGA..multidot.cm at a current density of 0.0025 A/cm.sup.2. Using such an electrodialyzer shown in FIG. 3, production of deionized water was carried out as follows. The electrodialyzer was the one consisting of a filter press type dialyzer having **cation exchange membranes** (strongly acidic heterogeneous membranes, thickness: 500 .mu.m, ion exchange capacity: 2.7 meq/g dry resin) and **anion exchange membranes** (strongly basic **heterogeneous** membranes, thickness: 500 .mu.m, **exchange** capacity: 2.1 meq/g dry resin) alternately arranged and clamped via demineralizing compartment frames (made of polypropylene having a thickness of 1.2 cm) and concentrating compartment frames (made of polypropylene having a thickness of 0.2 cm) and having an effective surface area of 507 cm.sup.2 (width: 13 cm, length: 39 cm).times.5 pairs of the demineralizing compartment and the concentrating compartment.

DETD According to the apparatus for producing deionized water of the present invention, the contact of the ion exchanger particles with one another and with the **ion exchange membranes,** is increased as accommodated in the demineralizing compartments of an electrodialyzer, whereby the resistivity can be reduced, and the thickness of the demineralizing compartments can be made large. Accordingly, it is possible to obtain an apparatus having a large production rate of deionized water with a relatively small effective surface area of the membrane.

CLM What is claimed is:

1. An apparatus for producing deionized water comprising an electrodialyzer having **cation exchange membranes** and **anion exchange membranes** alternatively arranged between a cathode and an anode to form demineralizing compartments and concentrating compartments and ion exchangers accommodated in the demineralizing compartments, wherein a pressure of from 0.1 to 20 kg/cm.sup.2 is exerted between the ion

exchangers accommodated in the demineralizing compartments and the **cation exchange membranes** and **anion exchange membranes** defining the demineralizing compartments, and wherein said pressure is formed by mechanically reducing the volume of the demineralizing compartments.

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L4 ANSWER 11 OF 23 USPATFULL on STN

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| ACCESSION NUMBER: | 1999:106502 USPATFULL |
| TITLE: | **Heterogeneous ion exchange membrane** and process for its production |
| INVENTOR(S): | Terada, Ichiro, Yokohama, Japan<br>Higuchi, Yoshiaki, Yokohama, Japan<br>Miyake, Haruhisa, Yokohama, Japan<br>Umemura, Kazuo, Yokohama, Japan |
| PATENT ASSIGNEE(S): | Asahi Glass Company Ltd., Tokyo, Japan (non-U.S. corporation) |

| | NUMBER | KIND | DATE | |
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| PATENT INFORMATION: | US 5948826 | | 19990907 | |
| APPLICATION INFO.: | US 1997-898957 | | 19970723 | (8) |

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|---|---|---|
| PRIORITY INFORMATION: | JP 1996-194196 | 19960724 |

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|---|---|
| DOCUMENT TYPE: | Utility |
| FILE SEGMENT: | Granted |
| PRIMARY EXAMINER: | Zitomer, Fred |
| LEGAL REPRESENTATIVE: | Oblon, Spivak, McClelland, Maier & Neustadt, P.C. |
| NUMBER OF CLAIMS: | 10 |
| EXEMPLARY CLAIM: | 1 |
| LINE COUNT: | 456 |

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

TI **Heterogeneous ion exchange membrane** and process for its production

AB A **heterogeneous ion exchange membrane** comprising an ion exchange resin and a binder polymer, wherein the binder polymer is a polymer containing at least a mixture comprising low density polyethylene and ethylene-propylene rubber or ethylene-propylene-diene rubber.

SUMM The present invention relates to a **heterogeneous ion exchange membrane**, particularly an **ion exchange membrane** for adsorbing or permeation separating ions in an aqueous solution.

SUMM **Ion exchange membranes** have been reported in many literatures and patents. Styrene-divinylbenzene copolymer type homogeneous **ion exchange membranes** may be mentioned as the most practical and useful ones. In addition to their chemical resistance and heat resistance, these **ion exchange membranes** have a merit such that the ion exchange characteristics and the selective permeability can be controlled by changing the content of divinylbenzene as a crosslinking agent. Accordingly, they have been developed as various types of products synthesized for various applications. Especially in the field of concentrating seawater by electrodialysis relating to manufacture of common salt, membranes having low electrical resistance, a high transport number and a high level of function to selectively permeate

monovalent ions, have been developed.

SUMM However, such styrene-divinylbenzene copolymer type **ion exchange membranes** are costly since they require cumbersome and highly sensitive process steps for polymerization and reaction. Further, it is difficult to control the heat thereby generated or the dimensional change, and there has been a drawback that the yield tends to be low, and the product tends to be expensive.

SUMM As a means to solve such drawbacks, Chinese Patent Publication No. 1,044,411 discloses a case wherein a mixture comprising linear low density polyethylene, an ethylene-vinyl acetate copolymer as a flexible material and polyisobutene rubber, is used as a binder polymer. However, the ethylene-vinyl acetate copolymer is poor in chemical resistance and durability, and accordingly, such a method has had a drawback that it is hardly possible to obtain an **ion exchange membrane** having adequate properties durable for use for a long period of time.

SUMM The present invention has been made to solve the above-mentioned problems of the prior art and to provide a novel **heterogeneous ion exchange membrane** and a process for its production.

SUMM Namely, the present invention provides a **heterogeneous ion exchange membrane** comprising an ion exchange resin and a binder polymer, wherein the binder polymer is a polymer containing at least a mixture comprising low density polyethylene and ethylene-propylene rubber or ethylene-propylene-diene rubber.

SUMM As the low density **polyethylene** constituting the **binder** polymer to be used in the present invention, preferred is one having a density of from 0.880 to 0.930 g/cm.sup.3, particularly from 0.900 to 0.926 g/cm.sup.3 and a melt flow rate, as an index for molecular weight, of from 3.0 to 30 g/10 min, as measured by JIS K6760. Here, the low density polyethylene includes linear low density polyethylene. Usual low density polyethylene and linear polyethylene may be used alone or in combination as a mixture. In the case of a mixture, it may be at any mixing ratio, so long as the physical properties of the mixture will be in the above ranges. On the other hand, as the ethylene-propylene rubber, preferred is one having a propylene content of from 25 to 50 wt % and a Mooney viscosity of from 35 to 50. As the ethylene-propylene-diene rubber, preferred is one having a propylene content of from 25 to 50 wt % and a Mooney viscosity of from 40 to 90.

SUMM The ion exchange resin to be used in the present invention may, for example, be a strongly acidic cation exchange resin, a strongly basic anion exchange rein or an amphoteric ion exchange resin. These resins may be used alone or in combination as a mixture. Particularly preferred is a cation exchange resin having sulfonic acid groups introduced to a styrene-divinylbenzene copolymer, or an anion exchange resin having quaternary ammonium groups introduced thereto. With respect to the mixing ratio of the ion exchange resin particles and the binder polymer, the weight ratio of the ion exchange resin/the binder polymer is preferably from 40/60 to 70/30, more preferably from 50/50 to 60/40. If the ion exchange resin is less than 40 wt %, the electrical resistance of the resulting **heterogeneous ion exchange membrane** tends to be remarkable high, such being undesirable. If the ion exchange resin exceeds 70 wt %, the mechanical strength tends to be so low that it tends to be difficult to form a membrane. In the present invention, in addition to the ion exchange resin and the binder

polymer, other substances, for example, a lubricant such as glycerol, may be added in an amount of from 5 to 10 wt %, as the case requires.

SUMM The ion exchange capacity of the ion exchange resin is preferably from 1.0 to 5.0 meq/g dry resin, more preferably from 3.0 to 4.8 meq/g dry resin. With respect to the particle size of the ion exchange resin particles, it is preferred that the maximum particle size is at most 150 .mu.m, and particles having particle sizes of from 100 to 150 .mu.m constitute at most 5 wt %, based on the entire material of ion exchange resin particles, and particles having particle sizes of at most 20 .mu.m constitute at most 20 wt %. If the maximum particle size exceeds 150 .mu.m, or if particles having particle sizes of from 100 to 150 .mu.m, constitute more than 5 wt %, pinholes are likely to be formed when a **heterogeneous ion exchange membrane** is formed, and the mechanical strength of the membrane tends to be low, such being undesirable. If ion exchange resin particles having particle sizes of at most 20 .mu.m exceeds 20 wt %, the surface area of the ion exchange resin particles increases too much, whereby kneading with the binder polymer tends to be inadequate, and defects are likely to form, such being undesirable. Further, if heat kneading is carried out sufficiently to eliminate defects, it takes time, ion exchange groups are likely to be decomposed as the kneading temperature increases, or the electrical resistance of the membrane tends to increase substantially, such being undesirable.

SUMM The **heterogeneous ion exchange membrane** of the present invention is prepared by a process which comprises preparing a mixture of solid particles comprising the above-mentioned ion exchange resin and a binder polymer which is a polymer containing the mixture of low density polyethylene and ethylene-propylene rubber or ethylene-propylene-diene rubber, melt-molding the mixture of solid particles to form a membrane product.

SUMM The proportions of the ion exchange resin and the binder polymer to be used for the above process, are as described above. Mixing of low density **polyethylene** and rubber to form the **binder** polymer, and mixing of the binder polymer with the ion exchange resin, are preferably carried out to obtain the respective mixtures as uniform as possible. In some cases, these mixtures may be melt-molded to obtain pellets having a diameter of from 2 to 6 mm.

SUMM The **ion exchange membrane** of the present invention can be used as an **ion exchange membrane** useful for electrodialysis for e.g. concentrating seawater, demineralizing water, concentrating and recovering acids or recovering valuable metals, or for diffusion dialysis for e.g. recovering acids, or for a separator for e.g. secondary cells. It is particularly useful for production of industrial water and drinking water by electrodialytic demineralization of water or for production of pure water by self regeneration type electrodialysis, wherein an ion exchange resin and an **ion exchange membrane** are used in combination to produce pure water.

DETD On the other hand, as an ion exchange resin, Diaion SK-1B (styrene-divinylbenzene copolymer resin, ion exchange groups: --SO.sub.3 Na type, apparent density: 0.825 g/ml, water content; 43 to 50 wt %, ion exchange capacity; 2.0 meq/me) manufactured by Mitsubishi Chemical Corporation being a strongly acidic cation exchange resin, was used, and the resin was dried in a hot air at 60.degree. C. for 24 hours and then pulverized by a jet mill. The pulverized particles were sieved by a stainless steel mesh to remove particles having particle sizes exceeding 150 .mu.m. The particle size distribution of the obtained powder

particles of ion exchange resin having particle size of at most 150 .mu.m was measured by sieving, whereby particles having particle sizes of from 100 to 150 .mu.m were 1.2 wt %, and particles having particle sizes of at most 20 .mu.m were 12 wt %. Such ion exchange resin particles and the above-mentioned low density polyethylene/ethylene-propylene-diene rubber mixture were mixed in a mixing ratio of 60/40 (weight ratio) and kneaded in a laboplastomill at 130.degree. C. at 50 rpm for 20 minutes. The obtained kneaded product was subjected to hot melt pressing by a flat plate press at 160.degree. C. to obtain a **cation exchange membrane** having a thickness of 500 .mu.m.

DETD An **anion exchange membrane** having a thickness of 500 .mu.m was prepared in the same manner as in Example 1 except that as the ion exchange resin, Diaion SA-10A (styrene-divinylbenzene copolymer resin, ion exchange groups: --N(CH.sub.3).sub.3 Cl type, apparent density: 0.685 g/ml, water content: 43 to 47 wt %, ion exchange capacity: 1.3 meq/ml) manufactured by Mitsubishi Chemical Corporation being a strongly basic anion exchange resin, was used. The particle size distribution of particles of the ion exchange resin powder having particle sizes of at most 150 .mu.m, was such that particles having particle sizes of from 100 to 150 .mu.m were 0.9 wt %, and particles having particle sizes of at most 20 .mu.m were 8 wt %. The obtained membrane was dipped in deionized water at 50.degree. for 2 days, whereupon the electrical resistance of the membrane was measured at an alternate current of 1,000 Hz in a 0.5N sodium chloride aqueous solution, whereby the resistivity was 300 .OMEGA..multidot.cm. Further, the strength at break of this membrane was 2.5 MPa, the elongation at break was 150%, and the bursting strength was 0.13 MPa. Further, the permeability of water was measured by putting water on one side of the membrane to exert a pressure of 0.35 kg/cm.sup.2, whereby the water permeation rate was as low as 30 ml/h.multidot.m.sup.2, and deformation of the membrane against pressure was little.

DETD A **cation exchange membrane** having a thickness of 500 .mu.m was prepared in the same manner as in Example 1 except that the above polymer was used as the binder polymer. The obtained membrane was dipped in deionized water at 50.degree. C. for 2 days, whereupon the electrical resistance of the membrane was measured at an alternate current of 1,000 Hz in a 0.5N sodium chloride aqueous solution, whereby the resistivity was 480 .OMEGA..multidot.cm. Further, the strength at break of this membrane was 2.5 MPa, the elongation at break was 130%, and the bursting strength was 0.12 MPa. Further, the permeability of water was measured by putting water on one side of the membrane to exert a pressure of 0.35 kg/cm.sup.2, whereby the water permeation rate was as low as 18 ml/h.multidot.m.sup.2, and deformation of the membrane against pressure was little.

DETD An **anion exchange membrane** having a thickness of 500 .mu.m was prepared in the same manner as in Example 2 except that the above polymer was used as the binder polymer. The obtained membrane was dipped in deionized water at 50.degree. C. for 2 days, whereupon the electrical resistance of the membrane was measured at an alternate current of 1,000 Hz in a 0.5N sodium chloride aqueous solution, whereby the resistivity was 250 .OMEGA..multidot.cm. Further, the strength at break of this membrane was 2.0 MPa, the elongation at break was 120%, and the bursting strength was 0.12 MPa. Further, the permeability of water was measured by putting water on one side of the membrane to exert a pressure of 0.35 kg/cm.sup.2, whereby the water permeation rate was as low as 60 ml/h.multidot.m.sup.2, and deformation of the membrane against pressure was little.

DETD A **cation exchange membrane** having a thickness of 500 .mu.m was prepared in the same manner as in Example 1 except that to the low density polyethylene/ethylene-propylene-diene rubber mixture obtained in Example 1, high density polyethylene

(Mitsubishi Polyethy HD-HJ290, tradename, manufactured by Mitsubishi Chemical Corporation) was mixed in a weight ratio of 75/25, and the mixture was used as the binder polymer. The obtained membrane was dipped in deionized water at 50.degree. C. for 2 days, whereupon the electrical resistance of the membrane was measured at an alternate current of 1,000 Hz in a 0.5N sodium chloride aqueous solution, whereby the resistivity was 400 .OMEGA..multidot.cm. Further, the strength at break of this membrane was 2.0 MPa, the elongation at break was 120%, and the bursting strength was 0.12 MPa. Further, the permeability of water was measured by putting water on one side of the membrane to exert a pressure of 0.35 kg/cm.sup.2, whereby the water permeation rate was as low as 80 ml/h.multidot.m.sup.2, and deformation of the membrane against pressure was little.

DETD A **cation exchange membrane** having a thickness of 500 .mu.m was prepared in the same manner as in Example 1 except that in Example 1, the ethylene-hexene-1 copolymer (Mitsubishi Polyethy C6-SF240, tradename, manufactured by Mitsubishi Chemical Corporation) was used as the binder polymer. The obtained membrane was dipped in deionized water at 50.degree. C. for 2 days, whereupon the electrical resistance of the membrane was measured at an alternate current of 1,000 Hz in a 0.5N sodium chloride aqueous solution, whereby the resistivity was as low as 350 .OMEGA..multidot.cm, but the strength at break of this membrane was 1.3 MPa, the elongation at break was 70%, and the bursting strength was 0.08 MPa, and thus the strength was poor. Further, the permeability of water was measured by putting water on one side of the membrane to exert a pressure of 0.35 kg/cm.sup.2, whereby the water permeation rate was as high as 500 ml/h.multidot.m.sup.2, and deformation of the membrane against pressure was substantial.

DETD An **anion exchange membrane** having a thickness of 500 .mu.m was prepared in the same manner as in Example 2 except that the low density polyethylene/ethylene-propylenediene rubber mixture obtained in Example 1 and high density polyethylene (Mitsubishi Polyethy HD-HJ290, tradename, manufactured by Mitsubishi Chemical Corporation) were mixed in a weight ratio of 25/75, and the mixture was used as a binder polymer, and the mixing conditions of the anion exchange resin powder particles and the above binder polymer were changed to 160.degree. C., 50 rpm and 20 minutes. The obtained membrane was dipped in deionized water at 50.degree. C. for 2 days, whereupon the electrical resistance of the membrane was measured at an alternate current of 1,000 Hz in a 0.5N sodium chloride aqueous solution, whereby the resistivity was as high as 1,000 .OMEGA..multidot.cm. Further, the strength at break of this membrane was 1.0 MPa, the elongation at break was 60%, and the bursting strength was 0.07 MPa, and thus the strength was low. Further, the permeability of water was measured by putting water on one side of the membrane to exert a pressure of 0.35 kg/cm.sup.2, whereby the water permeation rate was as high as 2,500 ml/h.multidot.m.sup.2, and deformation of the membrane against pressure was large.

DETD As described in the foregoing, the improved **heterogeneous ion exchange membrane** of the present invention is not only inexpensive but also has merits such that the electrical resistance is relatively low and the mechanical strength is high.

CLM What is claimed is:

1. A **heterogeneous ion exchange membrane** comprising an ion exchange resin and a polymeric binder, wherein the binder is a mixture comprising low density polyethylene and from 10 to 50 wt % of rubber, wherein the rubber is at least one selected from the group consisting of ethylene-propylene rubber and ethylene-propylene-diene rubber.

2. The **heterogeneous ion exchange**

**membrane** according to claim 1, wherein the binder polymer is a polymer containing at least 40 wt %, based on the binder polymer, of said mixture.

3. The **heterogeneous ion exchange membrane** according to claim 1, wherein the mixture comprising low density polyethylene and rubber is a polymer having physical properties of a surface hardness (Shore A) of from 80 to 97, a tensile strength at break of at least 130 kg/cm.sup.2, an elongation at break of from 700 to 900% and a Vicat softening point of from 75 to 130.degree. C.

4. The **heterogeneous ion exchange membrane** according to claim 1, wherein the mixing ratio of the ion exchange resin/the binder polymer is from 40/60 to 70/30 (weight ratio).

5. The **heterogeneous ion exchange membrane** according to claim 1, wherein the ion exchange resin is a strongly acidic cation exchange resin, a strongly basic anion exchange resin, an amphoteric ion exchange resin or a mixture thereof.

6. The **heterogeneous ion exchange membrane** according to claim 1, wherein the **heterogeneous ion exchange membrane** is in the form of a hollow fiber.

7. A process for producing a **heterogeneous ion exchange membrane**, which comprises preparing a mixture of solid particles comprising an ion exchange resin and a polymeric binder wherein the binder is a mixture comprising low density polyethylene and from 10 to 50 wt % of rubber, wherein the rubber is at least one selected from the group consisting of ethylene-propylene rubber and ethylene-propylene-diene rubber, melt-molding the mixture of solid particles to obtain a membrane product.

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     (FILE 'HOME' ENTERED AT 14:32:27 ON 11 DEC 2003)
               SET ABBR ON PERM
               SET PLURALS ON PERM

     FILE 'USPATFULL, USPAT2, JAPIO, CAPLUS' ENTERED AT 14:32:54 ON 11 DEC 2003
L1         26242 S (CATION### OR ANION### OR ION) (1W) (EXCHANGE MATERIAL OR EXC
L2          7628 S BIND#### (5A) (VERY LOW DENSITY (1W) ETHYLENE OR POLYETHYLENE
L3           116 S L1 AND L2
L4            23 S L3 AND HETEROGENEOUS (5W) EXCHANGE

=> s bind#### (8a) (single site or metallocene)
L5          954 BIND#### (8A) (SINGLE SITE OR METALLOCENE)

=> s l1 and l5
L6           10 L1 AND L5

=> d l6 1-10 ibib abs

L6   ANSWER 1 OF 10  USPATFULL on STN
ACCESSION NUMBER:       2003:264741  USPATFULL
TITLE:                  Novel ectoparasite saliva proteins and apparatus to
                        collect such proteins
```

INVENTOR(S): Frank, Glenn R., Wellington, CO, UNITED STATES
Hunter, Shirley W., Ft. Collins, CO, UNITED STATES
Wallenfels, Lynda, St. George, UT, UNITED STATES
PATENT ASSIGNEE(S): Heska Corporation. (U.S. corporation)

| | NUMBER | KIND | DATE |
|---|---|---|---|
| PATENT INFORMATION: | US 2003185755 | A1 | 20031002 |
| APPLICATION INFO.: | US 2002-271344 | A1 | 20021014 (10) |

RELATED APPLN. INFO.: Continuation of Ser. No. US 1997-809423, filed on 1 May 1997, ABANDONED A 371 of International Ser. No. WO 1995-US13200, filed on 6 Oct 1995, PENDING
DOCUMENT TYPE: Utility
FILE SEGMENT: APPLICATION
LEGAL REPRESENTATIVE: SHERIDAN ROSS PC, 1560 BROADWAY, SUITE 1200, DENVER, CO, 80202
NUMBER OF CLAIMS: 67
EXEMPLARY CLAIM: 1
NUMBER OF DRAWINGS: 15 Drawing Page(s)
LINE COUNT: 5498
CAS INDEXING IS AVAILABLE FOR THIS PATENT.
AB The present invention is directed to a novel product and method for isolating ectoparasite saliva proteins, and a novel product and method for detecting and/or treating allergic dermatitis in an animal. The present invention includes a saliva protein collection apparatus capable of collecting ectoparasite saliva proteins substantially free of contaminating material. The present invention also relates to ectoparasite saliva proteins, nucleic acid molecules having sequences that encode such proteins, and antibodies raised against such proteins. The present invention also includes methods to obtain such proteins and to use such proteins to identify animals susceptible to or having allergic dermatitis. The present invention also includes therapeutic compositions comprising such proteins and their use to treat animals susceptible to or having allergic dermatitis.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L6 ANSWER 2 OF 10 USPATFULL on STN
ACCESSION NUMBER: 2003:146871 USPATFULL
TITLE: Methods and apparatus for the formation of heterogeneous **ion-exchange membranes**
INVENTOR(S): Bernatowicz, Joseph M., Langhorne, PA, UNITED STATES
Snow, Michael J., Rancho Santa Fe, CA, UNITED STATES
O'Hare, Ronald J., South Laguna, CA, UNITED STATES

| | NUMBER | KIND | DATE |
|---|---|---|---|
| PATENT INFORMATION: | US 2003100618 | A1 | 20030529 |
| APPLICATION INFO.: | US 2003-336298 | A1 | 20030103 (10) |

RELATED APPLN. INFO.: Division of Ser. No. US 1999-444055, filed on 19 Nov 1999, GRANTED, Pat. No. US 6503957
DOCUMENT TYPE: Utility
FILE SEGMENT: APPLICATION
LEGAL REPRESENTATIVE: Frank Frisenda, Jr., Suite 470, 3993 Howard Hughes Parkway, Las Vegas, NV, 89109
NUMBER OF CLAIMS: 17
EXEMPLARY CLAIM: 1
NUMBER OF DRAWINGS: 1 Drawing Page(s)
LINE COUNT: 608
CAS INDEXING IS AVAILABLE FOR THIS PATENT.
AB The present invention provides methods and apparatus for the formation

of heterogeneous **ion-exchange membranes** by prescribed in-line compounding and extrusion of a polymeric binder and heat sensitive ion-exchange resin. The ion-exchange resin is incorporated, at a late process stage, into the melted matrix polymer at relatively low temperature and residence time prior to transfer to a die head for extrusion. In the presently preferred embodiment, the in-line compounding apparatus comprises a twin-screw compounding extruder, for effecting late stage kneading and mixing of ion-exchange resin and optional additives to the polymer melt, prior to compression to transfer the blended polymer melt to a die head for extrusion. Accordingly, the final properties of the resultant heterogeneous **ion-exchange membrane** are enhanced as the blended polymer melt material is not exposed to excessive heat and shear history. Resultant heterogeneous **ion-exchange membranes** and apparatus for treatment of fluid streams utilizing such membranes are also provided.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L6 ANSWER 3 OF 10 USPATFULL on STN

| | | | |
|---|---|---|---|
| ACCESSION NUMBER: | 2003:6935 USPATFULL | | |
| TITLE: | Methods and apparatus for the formation of heterogeneous **ion-exchange membranes** | | |
| INVENTOR(S): | Bernatowicz, Joseph M., Langhorne, PA, United States<br>Snow, Michael J., Rancho Santa Fe, CA, United States<br>O'Hare, Ronald J., South Laguna, CA, United States | | |
| PATENT ASSIGNEE(S): | Electropure, Inc., Laguna Hills, CA, United States (U.S. corporation) | | |
| | NUMBER | KIND | DATE |
| PATENT INFORMATION: | US 6503957 | B1 | 20030107 |
| APPLICATION INFO.: | US 1999-444055 | | 19991119 (9) |
| DOCUMENT TYPE: | Utility | | |
| FILE SEGMENT: | GRANTED | | |
| PRIMARY EXAMINER: | Zitomer, Fred | | |
| LEGAL REPRESENTATIVE: | Frisenda, Jr, Frank | | |
| NUMBER OF CLAIMS: | 14 | | |
| EXEMPLARY CLAIM: | 1 | | |
| NUMBER OF DRAWINGS: | 1 Drawing Figure(s); 1 Drawing Page(s) | | |
| LINE COUNT: | 579 | | |

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

AB The present invention provides methods and apparatus for the formation of heterogeneous **ion-exchange membranes** by prescribed in-line compounding and extrusion of a polymeric binder and heat sensitive ion-exchange resin. The ion-exchange resin is incorporated, at a late process stage, into the melted matrix polymer at relatively low temperature and residence time prior to transfer to a die head for extrusion. In the presently preferred embodiment, the in-line compounding apparatus comprises a twin-screw compounding extruder, for effecting late stage kneading and mixing of ion-exchange resin and optional additives to the polymer melt, prior to compression to transfer the blended polymer melt to a die head for extrusion. Accordingly, the final properties of the resultant heterogeneous **ion-exchange membrane** are enhanced as the blended polymer melt material is not exposed to excessive heat and shear history. Resultant heterogeneous **ion-exchange membranes** and apparatus for treatment of fluid streams utilizing such membranes are also provided.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L6 ANSWER 4 OF 10 USPATFULL on STN
ACCESSION NUMBER: 2002:301582 USPATFULL
TITLE: Compositions and methods for diagnosing or treating psoriasis
INVENTOR(S): Charmley, Patrick R., Seattle, WA, UNITED STATES
Smith, Ryan C., Seattle, WA, UNITED STATES
Argonza-Barrett, Rhodora H., Seattle, WA, UNITED STATES
Fitzgibbon, Matthew P., Bellevue, WA, UNITED STATES
Wang, Kai, Bellevue, WA, UNITED STATES

| | NUMBER | KIND | DATE | |
|---|---|---|---|---|
| PATENT INFORMATION: | US 2002169127 | A1 | 20021114 | |
| APPLICATION INFO.: | US 2002-112645 | A1 | 20020328 | (10) |

| | NUMBER | DATE |
|---|---|---|
| PRIORITY INFORMATION: | US 2001-280514P | 20010329 (60) |

DOCUMENT TYPE: Utility
FILE SEGMENT: APPLICATION
LEGAL REPRESENTATIVE: CHRISTENSEN, O'CONNOR, JOHNSON, KINDNESS, PLLC, 1420 FIFTH AVENUE, SUITE 2800, SEATTLE, WA, 98101-2347
NUMBER OF CLAIMS: 65
EXEMPLARY CLAIM: 1
LINE COUNT: 2411
CAS INDEXING IS AVAILABLE FOR THIS PATENT.
AB The present invention provides nucleic acid molecules, polypeptides, antibodies and methods for the diagnosis and/or treatment of psoriasis.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L6 ANSWER 5 OF 10 USPATFULL on STN
ACCESSION NUMBER: 2002:301559 USPATFULL
TITLE: NOVEL ECTOPARASITE SALIVA PROTEINS AND APPARATUS TO COLLECT SUCH PROTEINS
INVENTOR(S): FRANK, GLENN, WELLINGTON, CO, UNITED STATES
HUNTER, SHIRLEY, FT. COLLINS, CO, UNITED STATES
WALLENFELS, LYNDA, ST. GEORGE, UT, UNITED STATES

| | NUMBER | KIND | DATE | |
|---|---|---|---|---|
| PATENT INFORMATION: | US 2002169104 | A1 | 20021114 | |
| APPLICATION INFO.: | US 1997-809423 | A1 | 19970501 | (8) |
| | WO 1995-US13200 | | 19951006 | |

DOCUMENT TYPE: Utility
FILE SEGMENT: APPLICATION
LEGAL REPRESENTATIVE: SHERIDAN ROSS P.C., 1560 BROADWAY, SUITE 1200, DENVER, CO, 80202-5141
NUMBER OF CLAIMS: 67
EXEMPLARY CLAIM: 1
NUMBER OF DRAWINGS: 15 Drawing Page(s)
LINE COUNT: 5486
CAS INDEXING IS AVAILABLE FOR THIS PATENT.
AB The present invention is directed to a novel product and method for isolating ectoparasite saliva proteins, and a novel product and method for detecting and/or treating allergic dermatitis in an animal. The present invention includes a saliva protein collection apparatus capable of collecting ectoparasite saliva proteins substantially free of contaminating material. The present invention also relates to ectoparasite saliva proteins, nucleic acid molecules having sequences that encode such proteins, and antibodies raised against such proteins.

The present invention also includes methods to obtain such proteins and to use such proteins to identify animals susceptible to or having allergic dermatitis. The present invention also includes therapeutic compositions comprising such proteins and their use to treat animals susceptible to or having allergic dermatitis.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L6 ANSWER 6 OF 10 USPATFULL on STN

| | | | |
|---|---|---|---|
| ACCESSION NUMBER: | 2002:236136 USPATFULL | | |
| TITLE: | Heterogeneous **ion exchange membrane** and method of manufacturing thereof | | |
| INVENTOR(S): | Towe, Ian Glenn, Caledon Village, CANADA<br>Yagar, Mathew J., Waterloo, CANADA<br>Li, Guanghui, Guelph, CANADA | | |
| | NUMBER | KIND | DATE |
| PATENT INFORMATION: | US 2002128334 | A1 | 20020912 |
| APPLICATION INFO.: | US 2001-24255 | A1 | 20011221 (10) |
| RELATED APPLN. INFO.: | Continuation-in-part of Ser. No. WO 2000-CA741, filed on 21 Jun 2000, UNKNOWN | | |
| | NUMBER | DATE | |
| PRIORITY INFORMATION: | CA 1999-2275999 | 19990621 | |
| DOCUMENT TYPE: | Utility | | |
| FILE SEGMENT: | APPLICATION | | |
| LEGAL REPRESENTATIVE: | ARNE I. FORS, GOWLING, STRATHY & HENDERSON, SUITE 4900, COMMERCE COURT WEST, TORONTO, ON, M5L 1J3 | | |
| NUMBER OF CLAIMS: | 12 | | |
| EXEMPLARY CLAIM: | 1 | | |
| NUMBER OF DRAWINGS: | 2 Drawing Page(s) | | |
| LINE COUNT: | 479 | | |

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

AB A heterogeneous **ion exchange material** is provided which comprises an ion exchange resin incorporated within a binder, the binder comprising a material selected from the group consisting of: (i) a Metallocene catalyzed linear low density polyethylene, (ii) a very low density polyethylene or ultra low density polyethylene processed using either Ziegler-Natta catalysts or Metallocene catalysts, (iii) a thermoplastic elastomeric olefin comprising a polypropylene continuous phase with an ethylene-propylene-diene monomer or ethylene-propylene rubber rubbery phase dispersed through the polypropylene continuous phase, and (iv) a thermoplastic vulcanizate comprising a polypropylene continuous phase with an ethylene-propylene-diene monomer, ethylene-propylene rubber, nitrile-butadiene rubber, natural rubber or ethylene vinyl acetate rubbery phase dispersed through the polypropylene continuous phase. The **ion exchange membrane** can be manufactured using advanced extrusion techniques, including computer-controlled material fee, computer-controlled automatic die thickness adjustment with independently adjustable lip segments and nuclear gauge detection with feed-back control. It can also be manufactured by injection molding.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L6 ANSWER 7 OF 10 USPATFULL on STN

| | |
|---|---|
| ACCESSION NUMBER: | 1999:89047 USPATFULL |
| TITLE: | Ectoparasite saliva proteins and apparatus to collect such proteins |

INVENTOR(S): Frank, Glenn R., Wellington, CO, United States
Hunter, Shirley Wu, Ft. Collins, CO, United States
Wallenfels, Lynda, Ft. Collins, CO, United States
PATENT ASSIGNEE(S): Heska Corporation, Ft. Collins, CO, United States (U.S. corporation)

| | NUMBER | KIND | DATE |
|---|---|---|---|
| PATENT INFORMATION: | US 5932470 | | 19990803 |
| APPLICATION INFO.: | US 1998-5069 | | 19980108 (9) |

RELATED APPLN. INFO.: Division of Ser. No. US 1996-630822, filed on 10 Apr 1996, now patented, Pat. No. US 5840695 which is a continuation-in-part of Ser. No. WO 1995-US13200, filed on 6 Oct 1995 which is a continuation-in-part of Ser. No. US 1995-487001, filed on 7 Jun 1995, now patented, Pat. No. US 5795862 And a continuation-in-part of Ser. No. US 1995-487608, filed on 7 Jun 1995 which is a continuation-in-part of Ser. No. US 1994-319590, filed on 7 Oct 1994, now patented, Pat. No. US 5646115
DOCUMENT TYPE: Utility
FILE SEGMENT: Granted
PRIMARY EXAMINER: Wax, Robert A.
ASSISTANT EXAMINER: Stole, Einar
LEGAL REPRESENTATIVE: Ross P.C., Sheridan
NUMBER OF CLAIMS: 9
EXEMPLARY CLAIM: 1
NUMBER OF DRAWINGS: 12 Drawing Figure(s); 16 Drawing Page(s)
LINE COUNT: 6781
CAS INDEXING IS AVAILABLE FOR THIS PATENT.
AB The present invention is directed to a novel product and method for isolating ectoparasite saliva proteins, and a novel product and method for detecting and/or treating allergic dermatitis in an animal. The present invention includes a saliva protein collection apparatus capable of collecting ectoparasite saliva proteins substantially free of contaminating material. The present invention also relates to ectoparasite saliva proteins, nucleic acid molecules having sequences that encode such proteins, and antibodies raised against such proteins. The present invention also includes methods to obtain such proteins and to use such proteins to identify animals susceptible to or having allergic dermatitis. The present invention also includes therapeutic compositions comprising such proteins and their use to treat animals susceptible to or having allergic dermatitis.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L6 ANSWER 8 OF 10 USPATFULL on STN
ACCESSION NUMBER: 1998:147412 USPATFULL
TITLE: Ectoparasite saliva proteins and apparatus to collect such proteins
INVENTOR(S): Frank, Glenn R., Wellington, CO, United States
Hunter, Shirley Wu, Ft. Collins, CO, United States
Wallenfels, Lynda, St. George, UT, United States
PATENT ASSIGNEE(S): Heska Corporation, Ft. Collins, CO, United States (U.S. corporation)

| | NUMBER | KIND | DATE |
|---|---|---|---|
| PATENT INFORMATION: | US 5840695 | | 19981124 |
| APPLICATION INFO.: | US 1996-630822 | | 19960410 (8) |

RELATED APPLN. INFO.: Continuation-in-part of Ser. No. US 1995-487001, filed on 7 Jun 1995, now patented, Pat. No. US 5795862 which is a continuation-in-part of Ser. No. US 1995-487608,

filed on 7 Jun 1995 which is a continuation-in-part of Ser. No. US 1994-319590, filed on 7 Oct 1994, now patented, Pat. No. US 5646115
DOCUMENT TYPE: Utility
FILE SEGMENT: Granted
PRIMARY EXAMINER: Wax, Robert A.
ASSISTANT EXAMINER: Stole, Einar
LEGAL REPRESENTATIVE: Sheridan Ross P.C.
NUMBER OF CLAIMS: 41
EXEMPLARY CLAIM: 1
NUMBER OF DRAWINGS: 16 Drawing Figure(s); 16 Drawing Page(s)
LINE COUNT: 6531
CAS INDEXING IS AVAILABLE FOR THIS PATENT.
AB The present invention is directed to a novel product and method for isolating ectoparasite saliva proteins, and a novel product and method for detecting and/or treating allergic dermatitis in an animal. The present invention includes a saliva protein collection apparatus capable of collecting ectoparasite saliva proteins substantially free of contaminating material. The present invention also relates to ectoparasite saliva proteins, nucleic acid molecules having sequences that encode such proteins, and antibodies raised against such proteins. The present invention also includes methods to obtain such proteins and to use such proteins to identify animals susceptible to or having allergic dermatitis. The present invention also includes therapeutic compositions comprising such proteins and their use to treat animals susceptible to or having allergic dermatitis.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L6 ANSWER 9 OF 10 USPATFULL on STN
ACCESSION NUMBER: 1998:98886 USPATFULL
TITLE: Ectoparasite saliva proteins and apparatus to collect such proteins
INVENTOR(S): Frank, Glenn R., Wellington, CO, United States
Hunter, Shirley Wu, Ft. Collins, CO, United States
Wallenfels, Lynda, Ft. Collins, CO, United States
PATENT ASSIGNEE(S): Heska Corporation, Ft. Collins, CO, United States (U.S. corporation)

| | NUMBER | KIND | DATE |
|---|---|---|---|
| PATENT INFORMATION: | US 5795862 | | 19980818 |
| APPLICATION INFO.: | US 1995-487001 | | 19950607 (8) |

RELATED APPLN. INFO.: Continuation-in-part of Ser. No. US 1994-319590, filed on 7 Oct 1994, now patented, Pat. No. US 5646115
DOCUMENT TYPE: Utility
FILE SEGMENT: Granted
PRIMARY EXAMINER: Jacobson, Dian C.
LEGAL REPRESENTATIVE: Sherifan Ross P.C.
NUMBER OF CLAIMS: 29
EXEMPLARY CLAIM: 1
NUMBER OF DRAWINGS: 12 Drawing Figure(s); 12 Drawing Page(s)
LINE COUNT: 4678
CAS INDEXING IS AVAILABLE FOR THIS PATENT.
AB The present invention is directed to a novel product and method for isolating ectoparasite saliva proteins, and a novel product and method for detecting and/or treating allergic dermatitis in an animal. The present invention includes a saliva protein collection apparatus capable of collecting ectoparasite saliva proteins substantially free of contaminating material. The present invention also relates to ectoparasite saliva proteins, nucleic acid molecules having sequences that encode such proteins, and antibodies raised against such proteins.

The present invention also includes methods to obtain such proteins and to use such proteins to identify animals susceptible to or having allergic dermatitis. The present invention also includes therapeutic compositions comprising such proteins and their use to treat animals susceptible to or having allergic dermatitis.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L6 ANSWER 10 OF 10 CAPLUS COPYRIGHT 2003 ACS on STN
ACCESSION NUMBER: 2000:911336 CAPLUS
DOCUMENT NUMBER: 134:57748
TITLE: Heterogeneous **ion-exchange membrane** and its manufacture
INVENTOR(S): Towe, Ian Glenn; Yagar, Mathew J.
PATENT ASSIGNEE(S): E-Cell Corporation, Can.
SOURCE: PCT Int. Appl., 17 pp.
CODEN: PIXXD2
DOCUMENT TYPE: Patent
LANGUAGE: English
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

| PATENT NO. | KIND | DATE | APPLICATION NO. | DATE |
|---|---|---|---|---|
| WO 2000078849 | A1 | 20001228 | WO 2000-CA741 | 20000621 |
| W: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM | | | | |
| RW: GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW, AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG | | | | |
| EP 1203049 | A1 | 20020508 | EP 2000-940094 | 20000621 |
| R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO, MK, CY, AL | | | | |
| US 2002128334 | A1 | 20020912 | US 2001-24255 | 20011221 |

PRIORITY APPLN. INFO.: CA 1999-2275999 A 19990621
WO 2000-CA741 W 20000621

AB A heterogeneous **ion-exchange material** comprises an ion-exchange resin incorporated within a **binder** which comprises a material selected from (i) a **metallocene** -catalyzed linear low-d. polyethylene, (ii) a very low-d. polyethylene or ultra low-d. polyethylene produced using either Ziegler-Natta catalysts or metallocene catalysts, (iii) a thermoplastic olefin elastomeric material comprising a polypropylene continuous phase with a rubbery phase of ethylene-propylene-diene rubber or ethylene-propylene rubber dispersed through the polypropylene continuous phase, and (iv) a thermoplastic vulcanizate comprising a polypropylene continuous phase with an ethylene-propylene-diene rubber, ethylene-propylene rubber, nitrile-butadiene rubber, natural rubber, ethylene-vinyl acetate rubbery phase dispersed through the polypropylene continuous phase, a copolymer of vinylidene fluoride and hexafluoropropylene, or a copolymer of vinylidene fluoride, hexafluoropropylene, and tetrafluoroethylene. The **ion -exchange membrane** can be manufd. using advanced extrusion techniques, including computer-controlled material feed, computer-controlled automatic die thickness adjustment with independently adjustable lip segments and nuclear gauge detection with feed-back control.

REFERENCE COUNT: 11 THERE ARE 11 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

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=> d his

     (FILE 'HOME' ENTERED AT 14:32:27 ON 11 DEC 2003)
               SET ABBR ON PERM
               SET PLURALS ON PERM

     FILE 'USPATFULL, USPAT2, JAPIO, CAPLUS' ENTERED AT 14:32:54 ON 11 DEC 2003
L1         26242 S (CATION### OR ANION### OR ION) (1W) (EXCHANGE MATERIAL OR EXC
L2          7628 S BIND#### (5A) (VERY LOW DENSITY (1W) ETHYLENE OR POLYETHYLENE
L3           116 S L1 AND L2
L4            23 S L3 AND HETEROGENEOUS (5W) EXCHANGE
L5           954 S BIND#### (8A) (SINGLE SITE OR METALLOCENE)
L6            10 S L1 AND L5

=> s bind#### (8a) (vinylidene fluoride)
L7           817 BIND#### (8A) (VINYLIDENE FLUORIDE)

=> s l1 and l7
L8            14 L1 AND L7

=> d l8 1-14 ibib abs

L8   ANSWER 1 OF 14  USPATFULL on STN
ACCESSION NUMBER:       2003:231583  USPATFULL
TITLE:                  Novel carbon materials and carbon/carbon composites
                        based on modified poly (phenylene ether) for energy
                        production and storage devices, and methods of making
                        them
INVENTOR(S):            Cabasso, Israel, Syracuse, NY, UNITED STATES
                        Liu, Han, Waltham, MA, UNITED STATES
                        Li, Suoding, Syracuse, NY, UNITED STATES
                        Yuan, Youxin, Syracuse, NY, UNITED STATES

                             NUMBER       KIND    DATE
                        --------------- ------ --------
PATENT INFORMATION:     US 2003161781      A1   20030828
APPLICATION INFO.:      US 2001-968290     A1   20011001  (9)
DOCUMENT TYPE:          Utility
FILE SEGMENT:           APPLICATION
LEGAL REPRESENTATIVE:   MORGAN & FINNEGAN, L.L.P., 345 Park Avenue, New York,
                        NY, 10154-0053
NUMBER OF CLAIMS:       28
EXEMPLARY CLAIM:        1
NUMBER OF DRAWINGS:     21 Drawing Page(s)
LINE COUNT:             1354
CAS INDEXING IS AVAILABLE FOR THIS PATENT.
AB      It is MPPE based polymeric carbon materials with high electric and gas
        conductivity, large surface area with narrow pore size distribution,
        good mechanical strength, versatile applications and ease of
        manufacturing. The carbon material can be in the form of carbon powder,
        carbon fiber reinforced sheets or other types of carbon/carbon
        composites. This carbon material can be readily utilized in/as base
        materials for catalysts, adsorbent, water treatment materials,
        electrodes for double layer capacitors, fuel gas storage materials and
        fuel cell gas diffusion electrodes. The carbon is produced by oxidation
        of poly(phenylene ether) (PPE) in air or other oxygen containing
        atmospheres at temperatures near the glass transition temperature of
        PPE, followed by carbonization of the oxidized material in an inert
        atmosphere at elevated temperatures (400-3000.degree. C.) and activating
        the carbon materials with steam, carbon dioxide, oxygen containing
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gases, organic or inorganic bases and organic or inorganic acids. The carbon is characterized by high electric conductivity and high surface area with controllable pore size distribution. The method also involves modification of the original polymer with an oxidization process, forming the preform by casting, molding or extruding a mixture of polymer and other carbon materials, carbonizing the preform at elevated temperatures and activating such materials as aforementioned.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L8 ANSWER 2 OF 14 USPATFULL on STN

| | | | | |
|---|---|---|---|---|
| ACCESSION NUMBER: | 2003:10501 USPATFULL | | | |
| TITLE: | Fluid diffusion layers for fuel cells | | | |
| INVENTOR(S): | Chiem, Bien Hung, Burnaby, CANADA<br>Haas, Herwig Robert, Vancouver, CANADA<br>Stumper, Jurgen, Vancouver, CANADA<br>Fong, Kelvin Keen-Ven, Burnaby, CANADA<br>Wong-Cheung, Sonia Geillis, Burnaby, CANADA<br>Cao, Hong, Burnaby, CANADA<br>Kozak, Paul, Surrey, CANADA<br>Davis, Michael Todd, Port Coquitlam, CANADA | | | |
| | NUMBER | KIND | DATE | |
| PATENT INFORMATION: | US 2003008195 | A1 | 20030109 | |
| APPLICATION INFO.: | US 2002-177961 | A1 | 20020621 | (10) |
| | NUMBER | | DATE | |
| PRIORITY INFORMATION: | US 2001-301735P | | 20010628 | (60) |
| DOCUMENT TYPE: | Utility | | | |
| FILE SEGMENT: | APPLICATION | | | |
| LEGAL REPRESENTATIVE: | Robert W. Fieseler, McAndrews, Held & Malloy, Ltd., 500 West Madison Street, 34th Floor, Chicago, IL, 60661 | | | |
| NUMBER OF CLAIMS: | 6 | | | |
| EXEMPLARY CLAIM: | 1 | | | |
| NUMBER OF DRAWINGS: | 5 Drawing Page(s) | | | |
| LINE COUNT: | 636 | | | |

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

AB Fluid diffusion layers, as well as methods and compositions for making such fluid diffusion layers, include a loading material comprising both carbon black and graphite particles in a weight ratio of less than about 50:50. The fluid diffusion layers have favorable mechanical and electrical properties, such as air flow and through-plane resistance.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L8 ANSWER 3 OF 14 USPATFULL on STN

| | | | | |
|---|---|---|---|---|
| ACCESSION NUMBER: | 1998:85713 USPATFULL | | | |
| TITLE: | Gas diffusion electrodes based on poly(vinylidene fluoride) carbon blends | | | |
| INVENTOR(S): | Cabasso, Israel, Syracuse, NY, United States<br>Yuan, Youxin, Syracuse, NY, United States<br>Xu, Xiao, Fremont, CA, United States | | | |
| PATENT ASSIGNEE(S): | The Research Foundation of State of New York, Albany, NY, United States (U.S. corporation) | | | |
| | NUMBER | KIND | DATE | |
| PATENT INFORMATION: | US 5783325 | | 19980721 | |
| APPLICATION INFO.: | US 1996-697582 | | 19960827 | (8) |
| DOCUMENT TYPE: | Utility | | | |

FILE SEGMENT: Granted
PRIMARY EXAMINER: Kalafut, Stephen
LEGAL REPRESENTATIVE: Morgan & Finnegan, L.L.P.
NUMBER OF CLAIMS: 23
EXEMPLARY CLAIM: 1
NUMBER OF DRAWINGS: 7 Drawing Figure(s); 5 Drawing Page(s)
LINE COUNT: 813
CAS INDEXING IS AVAILABLE FOR THIS PATENT.
AB All electrocatalytic gas diffusion electrode for fuel cells and a process for its preparation is disclosed. The electrode comprises an anistropic gas diffusion layer and a catalytic layer. The gas diffusion layer is made of a porous carbon matrix through which carbon particles and poly(vinylidene) fluoride are distributed so that the matrix is homogeneously porous in a direction lateral to gas flow and asymmetrically porous to gases in the direction of the gas flow. The porosity of the gas diffusion layer decreases in the direction of gas flow. The catalytic layer is made of a coagulated ink suspension containing catalytic carbon particles and a thermoplastic polymer selected from polyethersulfone, poly(vinylidene fluoride) and sulfonated polysulfone and covers the small pore surface of the gas diffusion layer. The gas diffusion layer has a thickness between 50 .mu.m and 300 .mu.m. The catalytic layer has thickness between 7 .mu.m and 50 .mu.m and a metal catalyst loading between 0.2 mg/cm.sup.2 and 0.5 mg/cm.sup.2.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L8 ANSWER 4 OF 14 USPATFULL on STN
ACCESSION NUMBER: 79:22878 USPATFULL
TITLE: Method for the electrolytic production of chlorine from brine
INVENTOR(S): Fang, James C., Media, PA, United States
PATENT ASSIGNEE(S): E. I. Du Pont de Nemours and Company, Wilmington, DE, United States (U.S. corporation)

| | NUMBER | KIND | DATE |
|---|---|---|---|
| PATENT INFORMATION: | US 4153520 | | 19790508 |
| APPLICATION INFO.: | US 1978-895467 | | 19780411 (5) |

RELATED APPLN. INFO.: Division of Ser. No. US 1976-699302, filed on 24 Jun 1976, now abandoned which is a continuation-in-part of Ser. No. US 1975-579099, filed on 20 May 1975, now abandoned
DOCUMENT TYPE: Utility
FILE SEGMENT: Granted
PRIMARY EXAMINER: Andrews, R. L.
NUMBER OF CLAIMS: 1
EXEMPLARY CLAIM: 1
LINE COUNT: 799
CAS INDEXING IS AVAILABLE FOR THIS PATENT.
AB Certain fluoropolymers, when chemically modified by reacting them with sulfur or phosphorus containing compounds, become hydrophilic materials useful for making **ion-exchange membranes,** especially diaphragms for electrolytic cells, particularly chlor-alkali cells used in the production of chlorine, hydrogen and sodium hydroxide from brine.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L8 ANSWER 5 OF 14 USPATFULL on STN
ACCESSION NUMBER: 76:54368 USPATFULL
TITLE: Granulated ion exchangers consisting of polystyrene

exchangers with **vinylidene fluoride** copolymer or polythene-polyvinyl alcohol mixture as **binder**

INVENTOR(S): Nefedova, Galina Zakharovna, ULITSA Shukhova, 5/7, kv. 15, Moscow, USSR
Zhukov, Mark Alexandrovich, ULITSA Kl.Tsetkin, 13, kv. 40, Moscow, USSR
Pashkov, Arkady Borisovich, Khoroshevskoe shosse, 74, korpus 3, kv. 56, Moscow, USSR
Ljustgarten, Elena Isaakovna, ULITSA Chkalova, 7, kv. 6, Moscow, USSR
Slabkaya, Larisa Dmitrievna, ULITSA Poltavskaya, 2/25, kv. 19, Moscow, USSR
Vasilieva, Nadezhda Petrovna, ULITSA Kl.Tsetkin, 31, kv. 213., Moscow, USSR
Arefev, Gennady Grigorievich, ULITSA Moskvorechie, 78, kv. 56, Moscow, USSR
Savitsky, Eduard Konstantinovich, Vykhino, Samarkandsky bulvar, 24, korpus 1, kv. 91, Moscow, USSR
Kostjukhina, Ljudmila Ivanovna, Gospitalny val, 5, korpus 7, kv. 235, Moscow, USSR
Ostrovskaya, Sofya Abramovna, ULITSA Vorontsovskaya 30b, kv. 97, Moscow, USSR
Belkovskaya, Valentina Grigorievna, ULITSA Chernyshevskogo 38, kv. 3, Moscow, USSR

| | NUMBER | KIND | DATE |
|---|---|---|---|
| PATENT INFORMATION: | US 3984358 | | 19761005 |
| APPLICATION INFO.: | US 1974-447044 | | 19740228 (5) |

DOCUMENT TYPE: Utility
FILE SEGMENT: Granted
PRIMARY EXAMINER: Schofer, Joseph L.
ASSISTANT EXAMINER: Kulkosky, Peter F.
NUMBER OF CLAIMS: 1
EXEMPLARY CLAIM: 1
NUMBER OF DRAWINGS: 1 Drawing Figure(s); 1 Drawing Page(s)
LINE COUNT: 272

AB A composite material for the preparation of a granulated ion exchanger comprising

A. 75.0 to 6.0 wt % of ionite,

B. 5.0 to 0.0 wt % of pore former,

C. 20.0 to 40.0 wt % of thermoplastics used as a binding agent, wherein

A. is a ionite of any kind,

B. is selected from a group of neutral salts soluble in water,

C. is selected from a group consisting of polythene, polypropylene, fluorine copolymers and a mixture of polythene with polyvinyl alcohol.

L8 ANSWER 6 OF 14 CAPLUS COPYRIGHT 2003 ACS on STN
ACCESSION NUMBER: 2000:911336 CAPLUS
DOCUMENT NUMBER: 134:57748
TITLE: Heterogeneous **ion-exchange membrane** and its manufacture
INVENTOR(S): Towe, Ian Glenn; Yagar, Mathew J.
PATENT ASSIGNEE(S): E-Cell Corporation, Can.

SOURCE: PCT Int. Appl., 17 pp.
CODEN: PIXXD2
DOCUMENT TYPE: Patent
LANGUAGE: English
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

| PATENT NO. | KIND | DATE | APPLICATION NO. | DATE |
|---|---|---|---|---|
| WO 2000078849 | A1 | 20001228 | WO 2000-CA741 | 20000621 |
| W: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM | | | | |
| RW: GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW, AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG | | | | |
| EP 1203049 | A1 | 20020508 | EP 2000-940094 | 20000621 |
| R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO, MK, CY, AL | | | | |
| US 2002128334 | A1 | 20020912 | US 2001-24255 | 20011221 |

PRIORITY APPLN. INFO.: CA 1999-2275999 A 19990621
WO 2000-CA741 W 20000621

AB A heterogeneous **ion-exchange material** comprises an ion-exchange resin incorporated within a binder which comprises a material selected from (i) a metallocene-catalyzed linear low-d. polyethylene, (ii) a very low-d. polyethylene or ultra low-d. polyethylene produced using either Ziegler-Natta catalysts or metallocene catalysts, (iii) a thermoplastic olefin elastomeric material comprising a polypropylene continuous phase with a rubbery phase of ethylene-propylene-diene rubber or ethylene-propylene rubber dispersed through the polypropylene continuous phase, and (iv) a thermoplastic vulcanizate comprising a polypropylene continuous phase with an ethylene-propylene-diene rubber, ethylene-propylene rubber, nitrile-butadiene rubber, natural rubber, ethylene-vinyl acetate rubbery phase dispersed through the polypropylene continuous phase, a copolymer of vinylidene fluoride and hexafluoropropylene, or a copolymer of vinylidene fluoride, hexafluoropropylene, and tetrafluoroethylene. The **ion -exchange membrane** can be manufd. using advanced extrusion techniques, including computer-controlled material feed, computer-controlled automatic die thickness adjustment with independently adjustable lip segments and nuclear gauge detection with feed-back control.

REFERENCE COUNT: 11 THERE ARE 11 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L8 ANSWER 7 OF 14 CAPLUS COPYRIGHT 2003 ACS on STN
ACCESSION NUMBER: 1996:713739 CAPLUS
DOCUMENT NUMBER: 125:341115
TITLE: Membrane potential studies on inorganic **ion-exchange membrane** - electrochemical characterization of titanium dioxide membrane
AUTHOR(S): Singh, Kehar; Mishra, Neelam
CORPORATE SOURCE: Chemistry Dep., Gorakhpur Univ., Gorakhpur, 273 009, India
SOURCE: Indian Journal of Chemical Technology (1996), 3(6), 329-332
CODEN: ICHTEU; ISSN: 0971-457X
PUBLISHER: Publications & Information Directorate, CSIR
DOCUMENT TYPE: Journal

LANGUAGE: English

AB Prepn. of titanium dioxide membrane using Kynar (**vinylidene fluoride** resin) as **binder** was carried out with object of detn. of its electrochem. characteristics, permselectivity and fixed change d. from membrane potential measurements using sodium, magnesium and aluminum chloride solns. Variation of these electrochem. parameters with concn. and pH also was studied. A tendency towards inversion in the nature of ion selectivity is obsd. when electrolyte solns. having progressively lowered pH were used.

L8 ANSWER 8 OF 14 CAPLUS COPYRIGHT 2003 ACS on STN

ACCESSION NUMBER: 1983:169311 CAPLUS

DOCUMENT NUMBER: 98:169311

TITLE: Developments on IME-alkaline water electrolysis

AUTHOR(S): Vandenborre, H.; Leysen, R.; Nackaerts, H.

CORPORATE SOURCE: Studiecent. Kernenerg., CEN, Mol, B-2400, Belg.

SOURCE: International Journal of Hydrogen Energy (1983), 8(2), 81-3
CODEN: IJHEDX; ISSN: 0360-3199

DOCUMENT TYPE: Journal

LANGUAGE: English

AB A research program aimed at developing a new advanced concept in alk. water electrolytes was demonstrated under the auspices of the Commission of the European Communities. The 1st task was the development of an alkali-compatible **ion-exchange membrane** as a replacement for the chrysotile asbestos diaphragm. After a screening test, polyantimonic acid manufd. in thin sheets was shown to display the required ion conduction in alk. soln. Using polysulfone as an org. binder, the sheets withstood 120.degree. without deterioration. Several membrane characteristics, such as ionic conductance, membrane potential and Hittorf transference nos., were measured in different exptl. setups. The temp. dependence of the membrane conductance exhibits a 1.0-0.8 .OMEGA./cm2 range at 25.degree. to a 0.25-0.15 .OMEGA./cm2 range at 120.degree.. Gas tightness and mech. stability were demonstrated at 1000 h of continuous operation. The electrodes investigated were mainly composed of perforated Ni plates, catalytically activated using a thermal decompn. technique. Performances up to 120.degree. in 50 wt.% KOH for 2000 h operation were investigated for Ni, NiCo2O4, NiCoO2 and LaxCoO3 as the anode electrocatalyst. The spinel-type NiCo2O4 showed the best performance under the testing conditions. At the cathode, NiB, NiSx and NiCo2S4 were investigated .ltoreq.120.degree. as the H evolution electrocatalyst. A demonstration unit of a 1-kW electrolyzer was built to expt. on the newly introduced components (membranes, electrodes, gaskets, etc.). It consists of a 14-cell filter press unit, each cell of 40 cm2. The loop built around the stack allows an upscaling to 10 kW.

L8 ANSWER 9 OF 14 CAPLUS COPYRIGHT 2003 ACS on STN

ACCESSION NUMBER: 1983:90602 CAPLUS

DOCUMENT NUMBER: 98:90602

TITLE: Preparation of **ion exchange membranes** containing fluorine materials

AUTHOR(S): Jiang, Weida; Ding, Nanhu

CORPORATE SOURCE: Second Oceanogr. Inst., Natl. Bur. Oceanogr., Peop. Rep. China

SOURCE: Mo Fenli Kexue Yu Jishu (1982), 2(2), 64-8
CODEN: MFKJDB; ISSN: 0254-6140

DOCUMENT TYPE: Journal

LANGUAGE: Chinese

AB Durable corrosion-resistant membranes were prepd. from a powd. cation exchange resin (no. 732) or anion exchange resin (strongly basic 201.times.6) and a **binder** contg. 3:2:1 F23-14 (chlorotrifluoroethylene-**vinylidene fluoride**

copolymer) [9010-75-7]-polyethylene [9002-88-4]-rubber. Membranes having good properties were prepd. from 30:70 ion exchange resin-binder.

L8 ANSWER 10 OF 14 CAPLUS COPYRIGHT 2003 ACS on STN
ACCESSION NUMBER: 1977:96500 CAPLUS
DOCUMENT NUMBER: 86:96500
TITLE: Inorganic **ion exchange membranes**
AUTHOR(S): Alberti, Giulio
CORPORATE SOURCE: Ist. Chim. Inorg., Univ. Perugia, Perugia, Italy
SOURCE: Pontificiae Academiae Scientiarum Scripta Varia (1976), 40(Sem. Etude Theme: Membr. Biol. Artif. Desalin. Eau, 1975), 629-74
CODEN: PASVAE; ISSN: 0377-9971
DOCUMENT TYPE: Journal
LANGUAGE: English
AB Inorg. **ion exchange membranes** were prepd. and studied. They include Zr(HPO4)2, Ti(HPO4)2, Sn(HPO4)2, Zr(HAsO4)2, Ti(HAsO4)2, Sn(HAsO4)2, Ce(HPO4)2, Th(HPO4)2, Ce(HAsO4)2, and Th(HAsO4)2. Amorph., fibrous, and cryst. exchangers were studied. Poly(**vinylidene fluoride**) was used as a **binder**.

L8 ANSWER 11 OF 14 CAPLUS COPYRIGHT 2003 ACS on STN
ACCESSION NUMBER: 1971:100468 CAPLUS
DOCUMENT NUMBER: 74:100468
TITLE: Polymerization and copolymerization of 1,2,2-trifluorostyrene with regard to the preparation of ion exchangers
AUTHOR(S): Marschner, Horst; Wolf, Friedrich; Schwachula, Gerhard
CORPORATE SOURCE: Sekt. Chem., Martin-Luther-Univ. Halle-Wittenberg, Halle/Saale, Fed. Rep. Ger.
SOURCE: Zeitschrift fuer Chemie (1970), 10(12), 464-5
CODEN: ZECEAL; ISSN: 0044-2402
DOCUMENT TYPE: Journal
LANGUAGE: German
AB Homogeneous **ion exchange membranes** could not be prepd. from sulfonated poly-(trifluorostyrene) or from sulfonated styrene-trifluorostyrene copolymers (i.e., the membranes exhibited only slight flexibility), and heterogeneous membranes prepd. from sulfonated poly-(trifluorostyrene) and a **binder** comprising a trifluoroethylene-**vinylidene fluoride** copolymer exhibited unsatisfactory cond.

L8 ANSWER 12 OF 14 CAPLUS COPYRIGHT 2003 ACS on STN
ACCESSION NUMBER: 1970:36199 CAPLUS
DOCUMENT NUMBER: 72:36199
TITLE: Inorganic **ion exchange membranes** for use in electrical separation
INVENTOR(S): Rajan, Krishnaswamy S.; Casolo, Angelo J.
PATENT ASSIGNEE(S): United States Dept. of the Interior
SOURCE: U.S., 2 pp.
CODEN: USXXAM
DOCUMENT TYPE: Patent
LANGUAGE: English
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

| PATENT NO. | KIND | DATE | APPLICATION NO. | DATE |
|---|---|---|---|---|
| US 3479267 | A | 19691118 | US 1967-686829 | 19671130 |

PRIORITY APPLN. INFO.: US 1967-686829 19671130
AB A method is given for prepg. **ion exchange**

**membranes** of Group VIB metal s or metals of the actinide series contg. 15-70% binder. The metals are complexed by mixing 0.1-0.2% metal salt soln. with a 5% sol n. of the chelating agent and then admixed with 10-30% **binder** soln. such as poly(**vinylidene fluoride**), poly(tetrafluoroethylene), and poly(vinyl butyral) in org. solvents. The slurry is cast into 15-50 mil thick film, dried at 70-110.degree., and removed from the casting plate by equilibration in an aq. saline soln. Thus, a slurry contg. 10-15% Th-8-hydroxyquinoline complex, 25-30% HCONMe2, and 55-65% of a 20% soln. of poly(vinylidene fluoride) in AcNMe2 was cast in a 30 mil thick film, dried at 90.degree. for 2 hr, and removed from the support by equilibration in 0.5M KCl. The membrane had a resistance of 32 .OMEGA.-cm2 and a transference no. (0.05-0.10M KCl) of 0.60. The membrane had good stability when used in the electrodialysis of NaCl brine at 60.degree..

L8 ANSWER 13 OF 14 CAPLUS COPYRIGHT 2003 ACS on STN
ACCESSION NUMBER: 1968:478222 CAPLUS
DOCUMENT NUMBER: 69:78222
TITLE: Heterogeneous, **anion exchange membranes**
INVENTOR(S): Pashkov, A. N.; Nefedova, G. Z.; Leikin, Yu. A.; Tereshchenko, V. N.; Tereshchenko, M. N.; Pavlova, E. A.
SOURCE: U.S.S.R. From: Izobret., Prom. Obraztsy, Tovarnye Znaki 1968, 45(17), 77.
CODEN: URXXAF
DOCUMENT TYPE: Patent
LANGUAGE: Russian
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

| PATENT NO. | KIND | DATE | APPLICATION NO. | DATE |
|---|---|---|---|---|
| SU 218416 | | 19680517 | SU | 19670203 |

AB The title substance is prepd. by rolling a mixt. of anion exchanger and binder and subsequently pressing. An ion exchanger contg. quaternary NH4 groups and a mixt. of sulfochlorinated polyethylene and a hexafluoropropylene-**vinylidene fluoride** copolymer are used as the anion exchanger and **binder**, resp.

L8 ANSWER 14 OF 14 CAPLUS COPYRIGHT 2003 ACS on STN
ACCESSION NUMBER: 1967:40641 CAPLUS
DOCUMENT NUMBER: 66:40641
TITLE: Inorganic **ion-exchange membranes** and their application to electrodialysis
AUTHOR(S): Rajan, K. S.; Boies, David B.; Casolo, A. J.; Bregman, Jacob I.
CORPORATE SOURCE: Illinois Inst. of Technol. Res. Inst., Chicago, IL, USA
SOURCE: Desalination (1966), 1(3), 231-46
CODEN: DSLNAH; ISSN: 0011-9164
DOCUMENT TYPE: Journal
LANGUAGE: English
AB Sn, Ti, and Zr phosphates were used as cation-exchangers in the prepn. of **ion-exchange membranes**. Similarly, mixed hydroxides of Th with Mg++, Ca++, UO2++, Al3+, Cr3+, Zr4+, Ce4+, and Sn4+ were used as anion-exchangers. The **binder** was poly(**vinylidene fluoride**). The inorg, membranes obtained showed elec. resistances of 2-10 ohms-cm.2, comparable to those of com. org. membranes. Their transference nos. in 0.05-0.1M KCl were lower, ranging from 0.88 to 0.98. The performance of Zr phosphate and hydrated

Th oxide membranes in a multicompartment electrodialysis unit was examd. by using NaCl and KCl brines contg. 3000 ppm. total dissolved solids. Salt removals were 57.5 and 48.6%, resp., for NaCl and KCl brines. These values were slightly lower when HCO3-, SO4-, Ca++, or Mg++ were added to the brine. By increasing the temp. from 25 to 60.degree., the inorg. membranes showed a 31% decrease in overall stack resistance and a 30% increase in the salt removal with a lower power input. The current efficiency was not greatly affected. A satisfactory performance was also observed under conditions of fouling and in long-term electrodialysis tests. The inorg. membranes exhibited excellent phys. stability while the org. ones showed deterioration of hydraulic flow conditions in high temp. and fouling tests.

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=> FIL STNGUIDE
COST IN U.S. DOLLARS                                SINCE FILE      TOTAL
                                                         ENTRY    SESSION
FULL ESTIMATED COST                                     188.49     188.70

DISCOUNT AMOUNTS (FOR QUALIFYING ACCOUNTS)          SINCE FILE      TOTAL
                                                         ENTRY    SESSION
CA SUBSCRIBER PRICE                                     -12.37     -12.37

FILE 'STNGUIDE' ENTERED AT 14:59:34 ON 11 DEC 2003
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AND TECHNOLOGY CORPORATION, AND FACHINFORMATIONSZENTRUM KARLSRUHE

FILE CONTAINS CURRENT INFORMATION.
LAST RELOADED: Dec  5, 2003 (20031205/UP).

=> d l8 5 hit
YOU HAVE REQUESTED DATA FROM FILE 'USPATFULL, CAPLUS' - CONTINUE? (Y)/N:y


L8   ANSWER 5 OF 14  USPATFULL on STN
TI     Granulated ion exchangers consisting of polystyrene exchangers with
       vinylidene fluoride copolymer or polythene-polyvinyl
       alcohol mixture as binder
SUMM   The present invention relates to ion exchange
       materials, and more specifically to granulated ion exchangers.


=> file uspatall
COST IN U.S. DOLLARS                                SINCE FILE      TOTAL
                                                         ENTRY    SESSION
FULL ESTIMATED COST                                       0.12     191.75

DISCOUNT AMOUNTS (FOR QUALIFYING ACCOUNTS)          SINCE FILE      TOTAL
                                                         ENTRY    SESSION
CA SUBSCRIBER PRICE                                       0.00     -12.37

FILE 'USPATFULL' ENTERED AT 15:04:28 ON 11 DEC 2003
CA INDEXING COPYRIGHT (C) 2003 AMERICAN CHEMICAL SOCIETY (ACS)

FILE 'USPAT2' ENTERED AT 15:04:28 ON 11 DEC 2003
CA INDEXING COPYRIGHT (C) 2003 AMERICAN CHEMICAL SOCIETY (ACS)

=> s very low density (3w) ethylene
L9          279 VERY LOW DENSITY (3W) ETHYLENE
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```
=> s l9 and ziegler (1w) natta or metallocene
L10       8531 L9 AND ZIEGLER (1W) NATTA OR METALLOCENE

=> s l9 and ethylene (5a) (ziegler (1w) natta or metallocene)
L11         56 L9 AND ETHYLENE (5A) (ZIEGLER (1W) NATTA OR METALLOCENE)

=> s l11 1-10 ibib abs
MISSING OPERATOR L11 1-10
The search profile that was entered contains terms or
nested terms that are not separated by a logical operator.

=> d l11 1-10 ibib abs

L11  ANSWER 1 OF 56  USPATFULL on STN
ACCESSION NUMBER:        2003:294124  USPATFULL
TITLE:                   Sealable multi-layer opaque film
INVENTOR(S):             Kong, Dan-Cheng, Fairport, NY, UNITED STATES
                         Cleckner, Michael D., Naples, NY, UNITED STATES

                              NUMBER       KIND    DATE
                         ---------------- ------ --------
PATENT INFORMATION:      US 2003207137      A1   20031106
APPLICATION INFO.:       US 2002-135321     A1   20020501  (10)
DOCUMENT TYPE:           Utility
FILE SEGMENT:            APPLICATION
LEGAL REPRESENTATIVE:    EXXONMOBIL CHEMICAL COMPANY, P O BOX 2149, BAYTOWN, TX,
                         77522-2149
NUMBER OF CLAIMS:        40
EXEMPLARY CLAIM:         1
LINE COUNT:              883
CAS INDEXING IS AVAILABLE FOR THIS PATENT.
AB       A sealable multi-layer opaque film. In particular, a sealable
         multi-layer opaque film that is moisture permeable and water resistant.
         The sealable multi-layer opaque film is an oriented multilayer film with
         a core layer comprising an orientation-enhancing polymer, a
         polypropylene homopolymer and a beta crystal nucleator of polypropylene
         and at least one sealable skin layer.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L11  ANSWER 2 OF 56  USPATFULL on STN
ACCESSION NUMBER:        2003:282427  USPATFULL
TITLE:                   Fuel tank having a multilayer structure
INVENTOR(S):             Delbarre, Pierre, Ohlungen, FRANCE
PATENT ASSIGNEE(S):      TI Automotive Technology Center Gmbh (non-U.S.
                         corporation)

                              NUMBER       KIND    DATE
                         ---------------- ------ --------
PATENT INFORMATION:      US 2003198768      A1   20031023
APPLICATION INFO.:       US 2003-377470     A1   20030227  (10)
RELATED APPLN. INFO.:    Continuation-in-part of Ser. No. US 2001-782485, filed
                         on 13 Feb 2001, PENDING
DOCUMENT TYPE:           Utility
FILE SEGMENT:            APPLICATION
LEGAL REPRESENTATIVE:    REISING, ETHINGTON, BARNES, KISSELLE, P.C., P O BOX
                         4390, TROY, MI, 48099-4390
NUMBER OF CLAIMS:        27
EXEMPLARY CLAIM:         1
NUMBER OF DRAWINGS:      2 Drawing Page(s)
LINE COUNT:              1437
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CAS INDEXING IS AVAILABLE FOR THIS PATENT.

AB An automotive plastic fuel tank with a wall having a structural layer of HDPE and a hydrocarbon fuel barrier layer of an EVOH based material with a binder layer between them. The barrier layer prevents the passage of hydrocarbons through the wall to the atmosphere. The barrier layer is on an exterior face of the wall and preferably on the interior of the tank in direct contact with fuel therein. Preferably, the barrier includes a layer of polyamide (A) or a mixture of polyamide (A) and polyolefin (B).

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L11 ANSWER 3 OF 56 USPATFULL on STN

ACCESSION NUMBER: 2003:244064 USPATFULL

TITLE: Multilayer structure based on polyamides and on a tie layer made of a copolyamide blend

INVENTOR(S): Lacroix, Christophe, Harquency, FRANCE

PATENT ASSIGNEE(S): ATOFINA, Puteaux, FRANCE (non-U.S. corporation)

| | NUMBER | KIND | DATE |
|---|---|---|---|
| PATENT INFORMATION: | US 2003170473 | A1 | 20030911 |
| APPLICATION INFO.: | US 2003-353093 | A1 | 20030129 (10) |

| | NUMBER | DATE |
|---|---|---|
| PRIORITY INFORMATION: | FR 2002-1039 | 20020129 |
| | US 2002-358388P | 20020222 (60) |

DOCUMENT TYPE: Utility

FILE SEGMENT: APPLICATION

LEGAL REPRESENTATIVE: MILLEN, WHITE, ZELANO & BRANIGAN, P.C., 2200 CLARENDON BLVD., SUITE 1400, ARLINGTON, VA, 22201

NUMBER OF CLAIMS: 19

EXEMPLARY CLAIM: 1

LINE COUNT: 739

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

AB A multilayer structure based on polyamides, comprising:

a first layer (1) formed from a polyamide P.sub.1 or from a blend of a polyamide P.sub.1 and a polyolefin PO.sub.1 having a P.sub.1 polyamide matrix,

optionally, a layer (2a) formed from EVOH;

a layer (2) formed from a blend of PA-6/12 copolyamides, one comprising by weight more 6 than 12 and the other more 12 than 6;

a layer (3) formed from a polyamide P.sub.3,

it being possible for P.sub.1 and P.sub.3 to be identical or different, the layers (1), (2), (2a) and (3) being successive and adhering to one another in their respective contact regions.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L11 ANSWER 4 OF 56 USPATFULL on STN

ACCESSION NUMBER: 2003:237542 USPATFULL

TITLE: Multilayer structure based on polyamides and on a tie layer made of a copolyamide blend

INVENTOR(S): Lacroix, Christophe, Harquency, FRANCE

PATENT ASSIGNEE(S): ATOFINA, Puteaux, FRANCE (non-U.S. corporation)

| | NUMBER | KIND | DATE |
|---|---|---|---|

| | NUMBER | KIND | DATE |
|---|---|---|---|
| PATENT INFORMATION: | US 2003165699 | A1 | 20030904 |
| APPLICATION INFO.: | US 2003-353094 | A1 | 20030129 (10) |

| | NUMBER | DATE |
|---|---|---|
| PRIORITY INFORMATION: | FR 2002-1039 | 20020129 |
| | US 2002-358388P | 20020222 (60) |

DOCUMENT TYPE: Utility
FILE SEGMENT: APPLICATION
LEGAL REPRESENTATIVE: MILLEN, WHITE, ZELANO & BRANIGAN, P.C., 2200 CLARENDON BLVD., SUITE 1400, ARLINGTON, VA, 22201
NUMBER OF CLAIMS: 20
EXEMPLARY CLAIM: 1
LINE COUNT: 741
CAS INDEXING IS AVAILABLE FOR THIS PATENT.
AB A multilayer structure based on polyamides, comprising:

a first layer (1) formed from a polyamide P.sub.1 or from a blend of a polyamide P.sub.1 and a polyolefin PO.sub.1 having a P.sub.1 polyamide matrix,

optionally, a layer (2a) formed from EVOH;

a layer (2) formed from a blend of PA-6/12 copolyamides, one comprising by weight more 6 than 12 and the other more 12 than 6;

a layer (3) formed from a polyamide P.sub.3,

it being possible for P.sub.1 and P.sub.3 to be identical or different, the layers (1), (2), (2a) and (3) being successive and adhering to one another in their respective contact regions.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L11 ANSWER 5 OF 56 USPATFULL on STN
ACCESSION NUMBER: 2003:231800 USPATFULL
TITLE: Laminated cushioning article having recycled polyester barrier layer
INVENTOR(S): Kannankeril, Charles, North Caldwell, NJ, UNITED STATES
Freundlich, Richard, New York, NY, UNITED STATES
PATENT ASSIGNEE(S): Sealed Air Corporation (US) (U.S. corporation)

| | NUMBER | KIND | DATE |
|---|---|---|---|
| PATENT INFORMATION: | US 2003161999 | A1 | 20030828 |
| APPLICATION INFO.: | US 2002-82635 | A1 | 20020225 (10) |

DOCUMENT TYPE: Utility
FILE SEGMENT: APPLICATION
LEGAL REPRESENTATIVE: Sealed Air Corporation, P.O. Box 464, Duncan, SC, 29334
NUMBER OF CLAIMS: 20
EXEMPLARY CLAIM: 1
NUMBER OF DRAWINGS: 5 Drawing Page(s)
LINE COUNT: 817
CAS INDEXING IS AVAILABLE FOR THIS PATENT.
AB A cellular cushioning article comprises first and second multilayer films each having first and second outer layers, each of which contains an olefin-based polymer, and an inner O.sub.2-barrier layer. At least one of the O.sub.2-barrier layers contains recycled polyester. The first multilayer film is laminated to the second multilayer film so that a plurality of cells are formed between the first multilayer film and the second multilayer film. The cells can be discrete, fluid-filled cells

produced by forming one or both of the films. Alternatively, the cushioning article can be an inflatable article in which the films are adhered to one another in a pattern to form a series of inflatable chambers connected by inflatable passageways terminating in a dead-end chamber. Processes for making the articles are also disclosed.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L11 ANSWER 6 OF 56 USPATFULL on STN
ACCESSION NUMBER: 2003:194348 USPATFULL
TITLE: Sealable film
INVENTOR(S): Peet, Robert G., Pittsford, NY, UNITED STATES

| | NUMBER | KIND | DATE | |
|---|---|---|---|---|
| PATENT INFORMATION: | US 2003134159 | A1 | 20030717 | |
| APPLICATION INFO.: | US 2002-44022 | A1 | 20020111 | (10) |

DOCUMENT TYPE: Utility
FILE SEGMENT: APPLICATION
LEGAL REPRESENTATIVE: EXXONMOBIL CHEMICAL COMPANY, P O BOX 2149, BAYTOWN, TX, 77522-2149
NUMBER OF CLAIMS: 26
EXEMPLARY CLAIM: 1
NUMBER OF DRAWINGS: 1 Drawing Page(s)
LINE COUNT: 617
CAS INDEXING IS AVAILABLE FOR THIS PATENT.
AB A sealable film comprising a core layer comprising an olefin polymer wherein the core layer comprises the interior of the film; a separable layer exterior to the core layer, wherein the separable layer comprises a material or blend selected from the group consisting of impact copolymers; thermoplastic polyolefins; blends of impact copolymers and LLDPE's; blends of two or more incompatible polymers; and mixtures thereof; an optic improving layer exterior to the core layer and the separable layer, wherein the optic improving layer comprises a polymer having at least one of modulus, hardness, and/or beam strength being higher than the material of the separable layer; and a sealing layer exterior to the core layer, the separable layer, and the optic improving layer, wherein the sealing layer comprises a polymer.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L11 ANSWER 7 OF 56 USPATFULL on STN
ACCESSION NUMBER: 2003:187645 USPATFULL
TITLE: THERMOFORMABLE MULTI-LAYER FILM
INVENTOR(S): GLAWE, AMY LOU, DOWNERS GROVE, IL, UNITED STATES
RUBO, ADRIANA, SAO PAULO, BRAZIL
VICIK, STEPHEN JAMES, DARIEN, IL, UNITED STATES

| | NUMBER | KIND | DATE | |
|---|---|---|---|---|
| PATENT INFORMATION: | US 2003129434 | A1 | 20030710 | |
| APPLICATION INFO.: | US 1999-421605 | A1 | 19991020 | (9) |

DOCUMENT TYPE: Utility
FILE SEGMENT: APPLICATION
LEGAL REPRESENTATIVE: BRINKS HOFER GILSON & LIONE, P.O. BOX 10395, CHICAGO, IL, 60611
NUMBER OF CLAIMS: 35
EXEMPLARY CLAIM: 1
NUMBER OF DRAWINGS: 1 Drawing Page(s)
LINE COUNT: 447
CAS INDEXING IS AVAILABLE FOR THIS PATENT.
AB Thermoformable plastic films can be formed into bags, pouches, trays,

etc. which are useful when packaging foodstuffs and other products. These films enjoy widespread use in the packaging of meat and other oxygen sensitive products due to the gas permeation barrier provided. Thermoformable packaging films comprise one or more layers of thermoplastic, including olefinic copolymers, amorphous and crystalline nylons, ionomeric polymers, and polyolefins. By selecting the type and combination order of thermoplastics, a packaging film was developed that provides excellent impact and abrasion resistance, sealability, thermoformability, and optical clarity.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L11 ANSWER 8 OF 56 USPATFULL on STN

| | | | | |
|---|---|---|---|---|
| ACCESSION NUMBER: | 2003:180461 USPATFULL | | | |
| TITLE: | Tube made of vulcanized elastomer comprising polyamide and EVOH barrier layers | | | |
| INVENTOR(S): | Yamamoto, Jun, Tokyo, JAPAN<br>Merziger, Joachim, Evreux, FRANCE<br>Maldeme, Christophe, Rambouillet, FRANCE | | | |
| PATENT ASSIGNEE(S): | ATOFINA, Puteaux, FRANCE (non-U.S. corporation) | | | |
| | NUMBER | KIND | DATE | |
| PATENT INFORMATION: | US 2003124289 | A1 | 20030703 | |
| APPLICATION INFO.: | US 2002-303063 | A1 | 20021125 | (10) |
| | NUMBER | | DATE | |
| PRIORITY INFORMATION: | FR 2001-15184 | | 20011123 | |
| DOCUMENT TYPE: | Utility | | | |
| FILE SEGMENT: | APPLICATION | | | |
| LEGAL REPRESENTATIVE: | MILLEN, WHITE, ZELANO & BRANIGAN, P.C., 2200 CLARENDON BLVD., SUITE 1400, ARLINGTON, VA, 22201 | | | |
| NUMBER OF CLAIMS: | 18 | | | |
| EXEMPLARY CLAIM: | 1 | | | |
| LINE COUNT: | 1021 | | | |

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

AB The present invention relates to a multilayer tube comprising, in its radial direction from the outside inwards:

a first layer of vulcanized elastomer forming the outer layer,

a second layer of EVOH or of an EVOH-based blend,

a third layer of a blend of a polyamide (A) and a polyolefin (B) having a polyamide matrix,

optionally, an inner layer of vulcanized elastomer,

the layers being successive and adhering to one another in their respective contact region.

It is also possible to place a tie layer between the first and second layers, and likewise between the optional inner layer and the third layer.

The tube of the invention may also include a reinforcing layer of the textile type, for example made of polyester or of metal wires, the said layer being placed between the first and second layers. This reinforcing layer may be between the tie layer and the EVOH layer or between the tie layer and the outer layer or else the tie may be placed in the interstices of the reinforcing layer.

The tubes of the invention may have an outside diameter of between 8 mm and 25 cm. The thickness of the EVOH layer may be between 10 and 200 .mu.m, that of the blend of the polyamide (A) and the polyolefin (B) having a polyamide matrix between 25 and 500 .mu.m, and that of the optional tie layer between 10 and 100 .mu.m.

These tubes are used for fluids in air conditioning systems.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L11 ANSWER 9 OF 56 USPATFULL on STN

| | | | | |
|---|---|---|---|---|
| ACCESSION NUMBER: | 2003:180460 USPATFULL | | | |
| TITLE: | Polyamide- and EVOH-based conducting multilayer tube for transporting petrol | | | |
| INVENTOR(S): | Merziger, Joachim, Evreux, FRANCE<br>Lacroix, Christophe, Harquency, FRANCE | | | |
| PATENT ASSIGNEE(S): | ATOFINA, Puteaux, FRANCE (non-U.S. corporation) | | | |
| | NUMBER | KIND | DATE | |
| PATENT INFORMATION: | US 2003124288 | A1 | 20030703 | |
| APPLICATION INFO.: | US 2002-301826 | A1 | 20021122 | (10) |
| | NUMBER | DATE | | |
| PRIORITY INFORMATION: | FR 2001-15115 | 20011122 | | |
| | FR 2002-1840 | 20020214 | | |
| DOCUMENT TYPE: | Utility | | | |
| FILE SEGMENT: | APPLICATION | | | |
| LEGAL REPRESENTATIVE: | MILLEN, WHITE, ZELANO & BRANIGAN, P.C., 2200 CLARENDON BLVD., SUITE 1400, ARLINGTON, VA, 22201 | | | |
| NUMBER OF CLAIMS: | 23 | | | |
| EXEMPLARY CLAIM: | 1 | | | |
| LINE COUNT: | 1052 | | | |

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

AB The present invention relates to a multilayer tube comprising, in its radial direction from the outside inwards:

an outer layer formed from a polyamide chosen from PA-11 and PA-12,

a layer formed from a tie compound,

a layer formed from an EVOH,

a layer formed from a blend of a polyamide and a polyolefin having a polyamide matrix

a layer from a tie compound

an inner layer formed from a polyamide chosen from PA-11 and PA-12 and including a dispersed electrically conducting filler producing a surface resistivity of less than 10.sup.6.OMEGA.-.quadrature.,

the layers being successive and adhering to one another in their respective contact region.

The tube of the present invention has a very low permeability to petrol, particularly to hydrocarbons and their additives, and in particular to alcohols, such as methanol and ethanol, or to ethers, such as MTBE or ETBE. These tubes also have good resistance to engine lubrication oils and fuels.

The tube has very good mechanical properties at low or high temperatures.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L11 ANSWER 10 OF 56 USPATFULL on STN

| | | | | |
|---|---|---|---|---|
| ACCESSION NUMBER: | 2003:176200 USPATFULL | | | |
| TITLE: | Package with contoured seal | | | |
| INVENTOR(S): | Ramesh, Ram K., Greenville, SC, United States<br>Troutt, Terry L., Moore, SC, United States | | | |
| PATENT ASSIGNEE(S): | Cryovac, Inc., Duncan, SC, United States (U.S. corporation) | | | |
| | NUMBER | KIND | DATE | |
| PATENT INFORMATION: | US 6586026 | B1 | 20030701 | |
| | WO 9959817 | | 19991125 | |
| APPLICATION INFO.: | US 2000-646943 | | 20001207 | (9) |
| | WO 1999-US5995 | | 19990318 | |
| DOCUMENT TYPE: | Utility | | | |
| FILE SEGMENT: | GRANTED | | | |
| PRIMARY EXAMINER: | Bhat, Nina | | | |
| LEGAL REPRESENTATIVE: | Ruble, Daniel B. | | | |
| NUMBER OF CLAIMS: | 25 | | | |
| EXEMPLARY CLAIM: | 1 | | | |
| NUMBER OF DRAWINGS: | 3 Drawing Figure(s); 3 Drawing Page(s) | | | |
| LINE COUNT: | 771 | | | |

AB A packaged food article includes a meat product and a thermoplastic, heat shrinkable film. The film includes a meat-contact layer that contains a polymer which includes mer units derived from a C.sub.2-C.sub.4 .alpha.-olefin. The film is sealed so as to form a bag which encloses the meat product. At least one of the seals defines an arc which includes at least four segments. Each of the segments has a radius of curvature which differs from the radius of curvature of any adjoining segment. When the packaged food article is subjected to a temperature of from about 50.degree. C. up to about the Vicat softening point of the polymer of the meat-contact layer, the packaged food article takes the general shape of a poultry breast.

=> d l11 50-56 ibib abs

L11 ANSWER 50 OF 56 USPATFULL on STN

| | | | | |
|---|---|---|---|---|
| ACCESSION NUMBER: | 94:112804 USPATFULL | | | |
| TITLE: | Soft films having enhanced physical properties | | | |
| INVENTOR(S): | Hodgson, William J., Baytown, TX, United States<br>Halle, Richard W., Houston, TX, United States<br>Pierce, Charles L., Baytown, TX, United States | | | |
| PATENT ASSIGNEE(S): | Exxon Chemical Patents Inc., Linden, NJ, United States (U.S. corporation) | | | |
| | NUMBER | KIND | DATE | |
| PATENT INFORMATION: | US 5376439 | | 19941227 | |
| APPLICATION INFO.: | US 1994-219754 | | 19940329 | (8) |
| RELATED APPLN. INFO.: | Continuation of Ser. No. US 1992-945769, filed on 16 Sep 1992, now abandoned | | | |
| DOCUMENT TYPE: | Utility | | | |
| FILE SEGMENT: | Granted | | | |
| PRIMARY EXAMINER: | Seccuro, Jr., Carman J. | | | |

LEGAL REPRESENTATIVE: Sher, Jaimes
NUMBER OF CLAIMS: 32
EXEMPLARY CLAIM: 1
NUMBER OF DRAWINGS: 3 Drawing Figure(s); 3 Drawing Page(s)
LINE COUNT: 860
CAS INDEXING IS AVAILABLE FOR THIS PATENT.
AB The present invention provides for a polymer composition comprising a blend of from about 25 to about 90% by weight of a **very low density ethylene** polymer having a density on the range of from about 0.88 to 0.925 g/cm.sup.3, a melt index of from about 0.5 to about 7.5 dg/min, a molecular weight distribution not greater than about 3.5 and a compositional distribution breadth index greater than about 70%, and from about 10 to about 75% by weight of a low to medium density ethylene polymer having a density of from about 0.910 to about 0.935, a melt index of from about 0.5 to about 20, a molecular weight distribution greater than about 3.5 and a compositional breadth index less than about 70%.

The invention also provides for films prepared from this blend having single layer construction or having laminar ABA construction wherein the A or skin layers comprise the blend of this invention and the B or core layer comprises a different olefin polymer such as high density polyethylene.

Films of this invention exhibit excellent elongation, tensile and impact properties and also softness, feel and noise properties which render them eminently suitable for use as back sheet components in the fabrication of absorbent articles such as diapers, bed pads and like articles where such properties are desirable.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L11 ANSWER 51 OF 56 USPATFULL on STN
ACCESSION NUMBER: 94:93172 USPATFULL
TITLE: Heat sealable blend of very low density polyethylene or plastomer with polypropylene based polymers and heat sealable film and articles made thereof
INVENTOR(S): Mehta, Aspy K., Humble, TX, United States
Chen, Michael C., Duisburg-Tervuren, Belgium
PATENT ASSIGNEE(S): Exxon Chemical Patents Inc., Linden, NJ, United States (U.S. corporation)

| | NUMBER | KIND | DATE |
|---|---|---|---|
| PATENT INFORMATION: | US 5358792 | | 19941025 |
| APPLICATION INFO.: | US 1993-51594 | | 19930423 (8) |

RELATED APPLN. INFO.: Continuation of Ser. No. US 1991-660402, filed on 22 Feb 1991, now abandoned
DOCUMENT TYPE: Utility
FILE SEGMENT: Granted
PRIMARY EXAMINER: Seccuro, Jr., Carman J.
LEGAL REPRESENTATIVE: Sher, Jaimes
NUMBER OF CLAIMS: 16
EXEMPLARY CLAIM: 1
NUMBER OF DRAWINGS: 18 Drawing Figure(s); 8 Drawing Page(s)
LINE COUNT: 908
CAS INDEXING IS AVAILABLE FOR THIS PATENT.
AB Disclosed are heat sealable compositions comprising: (a) from about 30 to about 70 weight percent a low melting polymer comprising an ethylene based copolymer having a density of from about 0.88 g/cm.sup.3 to about 0.915 g/cm.sup.3, a melt index of from about 1.5 dg/min to about 7.5 dg/min, a molecular weight distribution no greater than about 3.5, and a

composition breadth index greater than about 70 percent; and, (b) from about 70 to about 30 weight percent of a propylene based polymer having from about 88 mole percent to about 100 mole percent propylene and from about 12 mole percent to about 0 mole percent of an alpha-olefin other than propylene. Further disclosed are films and articles made thereof.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L11 ANSWER 52 OF 56 USPATFULL on STN
ACCESSION NUMBER: 93:72177 USPATFULL
TITLE: Elastic articles having improved unload power and a process for their production
INVENTOR(S): Mehta, Aspy K., Humble, TX, United States
PATENT ASSIGNEE(S): Exxon Chemical Patents Inc., Linden, NJ, United States (U.S. corporation)

| | NUMBER | KIND | DATE | |
|---|---|---|---|---|
| PATENT INFORMATION: | US 5241031 | | 19930831 | |
| APPLICATION INFO.: | US 1992-837769 | | 19920219 | (7) |

DOCUMENT TYPE: Utility
FILE SEGMENT: Granted
PRIMARY EXAMINER: Teskin, Fred
LEGAL REPRESENTATIVE: Sher, Jaimes, Mulcahy, Robert W., Cadenhead, Ben C.
NUMBER OF CLAIMS: 26
EXEMPLARY CLAIM: 1
NUMBER OF DRAWINGS: 4 Drawing Figure(s); 4 Drawing Page(s)
LINE COUNT: 922
CAS INDEXING IS AVAILABLE FOR THIS PATENT.
AB Disclosed is a process for improving the unload power of a precursor elastic film comprising orienting the film to a draw ratio in the range of about 2:1 to about 20:1 followed by annealing. Further disclosed is an elastic film oriented to a draw ratio in the range of about 2:1 to about 20:1 and comprising a copolymer of ethylene polymerized with at least one comonomer selected from the group consisting of C.sub.3 to C.sub.20 alpha-olefins and C.sub.3 to C.sub.20 polyenes, wherein the copolymer has a density in the range of about 0.855 g/cm.sup.3 to about 0.9 g/cm.sup.3, a melt index in the range of about 0.5 to about 50, with a composition distribution index at least about 45 percent.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L11 ANSWER 53 OF 56 USPATFULL on STN
ACCESSION NUMBER: 93:33331 USPATFULL
TITLE: Sealable polyolefin films containing **very low density ethylene** copolymers
INVENTOR(S): Hodgson, Jr., William J., Baytown, TX, United States
PATENT ASSIGNEE(S): Exxon Chemical Patents Inc., Linden, NJ, United States (U.S. corporation)

| | NUMBER | KIND | DATE | |
|---|---|---|---|---|
| PATENT INFORMATION: | US 5206075 | | 19930427 | |
| APPLICATION INFO.: | US 1991-810473 | | 19911219 | (7) |

DOCUMENT TYPE: Utility
FILE SEGMENT: Granted
PRIMARY EXAMINER: Buffalow, Edith
LEGAL REPRESENTATIVE: Sher, Jaimes
NUMBER OF CLAIMS: 15
EXEMPLARY CLAIM: 1
LINE COUNT: 640

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

AB The invention provides laminar polyolefin film materials having a base film layer comprising a blend of an olefin polymer and up to about 30% by weight of at least one **very low density** copolymer of **ethylene** and a C.sub.3 to C.sub.20 alpha olefin comonomer copolymerizable with ethylene, said base layer having a heat sealable film layer present on one or both surfaces thereof comprising a **very low density** copolymer of **ethylene** and a copolymerizable C.sub.5 to C.sub.12 alpha olefin comonomer. The ethylene copolymer constituents of the film are characterized as having a density in the range of about 0.88 g/cm.sup.3 to abut 0.915 g/cm.sup.3, a melt index in the range of about 0.5 dg/min to about 7.5 dg/min, a molecular weight distribution (M.sub.w /M.sub.n) of about 1.5 to about 3.5 and an essentially single melting point in the range of about 60.degree. C. to about 115.degree. C., measured as a DSC peak T.sub.m.

Films of this invention exhibit extremely good hot tack seal strength at temperatures in the range of from about 200.degree. to 290.degree. F. thereby rendering them extremely useful as packaging materials in high speed packaging operations.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L11 ANSWER 54 OF 56 USPAT2 on STN

| | |
|---|---|
| ACCESSION NUMBER: | 2001:218118 USPAT2 |
| TITLE: | Composition and films thereof |
| INVENTOR(S): | Tau, Li-Min, Lake Jackson, TX, United States<br>Madenjian, Lisa S., Lake Jackson, TX, United States<br>Thoen, Johan A., Terneuzen, NETHERLANDS<br>Hoenig, Wendy D., Lake Jackson, TX, United States<br>Chum, Pak-Wing S., Lake Jackson, TX, United States<br>Kaarto, John, Verdun, CANADA<br>Falla, Daniel J., Sarnia, CANADA |
| PATENT ASSIGNEE(S): | Dow Global Technologies Inc., Midland, MI, United States (U.S. corporation) |

| | NUMBER | KIND | DATE | |
|---|---|---|---|---|
| PATENT INFORMATION: | US 6593005 | B2 | 20030715 | |
| APPLICATION INFO.: | US 2001-769129 | | 20010124 | (9) |

| | NUMBER | DATE | |
|---|---|---|---|
| PRIORITY INFORMATION: | US 2000-177781P | 20000124 | (60) |
| | US 2000-211048P | 20000612 | (60) |
| | US 2000-232977P | 20000914 | (60) |
| | US 2000-257513P | 20001222 | (60) |

| | |
|---|---|
| DOCUMENT TYPE: | Utility |
| FILE SEGMENT: | GRANTED |
| PRIMARY EXAMINER: | Nakarani, D. S. |
| NUMBER OF CLAIMS: | 46 |
| EXEMPLARY CLAIM: | 1 |
| NUMBER OF DRAWINGS: | 2 Drawing Figure(s); 2 Drawing Page(s) |
| LINE COUNT: | 1424 |

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

AB The present invention includes a coextruded film having at least two layers. The first layer contains a coupled propylene polymer and the second layer contains an in-reactor blend of a linear low density polyethylene fraction and a substantially linear polyethylene fraction. Alternatively, the second layer may include a homogeneously branched linear polyethylene. Preferably, the first layer makes up about 50

weight percent or less of the overall coextruded film structure. The first layer may also contain a polyethylene, such as a linear low density polyethylene, a low density polyethylene, a high density polyethylene, substantially linear polyethylene, a homogeneously branched linear polyethylene, an in-reactor blend of linear low density polyethylene and a substantially linear polyethyelene, and blends thereof.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L11 ANSWER 55 OF 56 USPAT2 on STN

| | |
|---|---|
| ACCESSION NUMBER: | 2001:182214 USPAT2 |
| TITLE: | Sealable film |
| INVENTOR(S): | Kong, Dan-Chang, Fairport, NY, United States<br>Peet, Robert G., Pittsford, NY, United States<br>Liu, Leland L., Fairport, NY, United States<br>Caputo, Michael J., Rochester, NY, United States |
| PATENT ASSIGNEE(S): | ExxonMobil Oil Corporation, Fairfax, VA, United States (U.S. corporation) |

| | NUMBER | KIND | DATE |
|---|---|---|---|
| PATENT INFORMATION: | US 6451426 | B2 | 20020917 |
| APPLICATION INFO.: | US 2000-727225 | | 20001129 (9) |

RELATED APPLN. INFO.: Continuation of Ser. No. US 1997-788551, filed on 24 Jan 1997, now patented, Pat. No. US 6231975

| | |
|---|---|
| DOCUMENT TYPE: | Utility |
| FILE SEGMENT: | GRANTED |
| PRIMARY EXAMINER: | Tarazano, D. Lawrence |
| LEGAL REPRESENTATIVE: | Santini, Dennis P., James, Rick F. |
| NUMBER OF CLAIMS: | 7 |
| EXEMPLARY CLAIM: | 1 |
| NUMBER OF DRAWINGS: | 0 Drawing Figure(s); 0 Drawing Page(s) |
| LINE COUNT: | 571 |

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

AB A sealable film comprises:

(a) an inner layer comprising an olefin polymer;

(b) a sealing layer; and

(c) a separable layer positioned between the inner layer and the sealing layer, the separable layer comprising (1) ethylene-propylene block copolymer or (2) a blend of polyethylene and another olefin which is incompatible with the polyethylene, specifically either (i) polypropylene homopolymer or (ii) ethylene-propylene block copolymer. Methods of making the sealable film are described.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L11 ANSWER 56 OF 56 USPAT2 on STN

| | |
|---|---|
| ACCESSION NUMBER: | 2001:89882 USPAT2 |
| TITLE: | Liquid plastic film pouch with inner straw |
| INVENTOR(S): | Edwards, John, Montreal, CANADA |
| PATENT ASSIGNEE(S): | Glopak Inc., Montreal, CANADA (non-U.S. corporation) |

| | NUMBER | KIND | DATE |
|---|---|---|---|
| PATENT INFORMATION: | US 6375002 | B2 | 20020423 |
| APPLICATION INFO.: | US 1998-76942 | | 19980513 (9) |

RELATED APPLN. INFO.: Continuation of Ser. No. US 1997-806126, filed on 28 Feb 1997, now patented, Pat. No. US 5782344

DOCUMENT TYPE: Utility
FILE SEGMENT: GRANTED
PRIMARY EXAMINER: Fidei, David T.
LEGAL REPRESENTATIVE: Carter & Schnedler, P.A.
NUMBER OF CLAIMS: 8
EXEMPLARY CLAIM: 1
NUMBER OF DRAWINGS: 9 Drawing Figure(s); 3 Drawing Page(s)
LINE COUNT: 333
CAS INDEXING IS AVAILABLE FOR THIS PATENT.

AB A liquid product carrying plastic film pouch having a straw which is free-floating in the liquid product, is described. The liquid product contained within the inner chamber of the pouch occupies from about 60% to about 90% of the volume of the inner chamber sufficient to permit the side walls of the pouch to be collapsed against one another when the pouch is grasped by the hand of a user person whereby to orient the straw at a desired location. The pouch is made of a multilayer resin film having an inner sealant layer formed of a linear low density ethylene-octene copolymer or **very low density ethylene** copolymer (octene or other copolymers) such that when the straw punctures the film, the inner sealant layer forms a membrane about the straw which exhibits a self-sealing behavior so as to prevent leakage in the punctured region as liquid is extracted from the pouch through the straw.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

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L11 ANSWER 53 OF 56 USPATFULL on STN

TI Sealable polyolefin films containing **very low density ethylene** copolymers

AB The invention provides laminar polyolefin film materials having a base film layer comprising a blend of an olefin polymer and up to about 30% by weight of at least one **very low density** copolymer of **ethylene** and a C.sub.3 to C.sub.20 alpha olefin comonomer copolymerizable with ethylene, said base layer having a heat sealable film layer present on one or both surfaces thereof comprising a **very low density** copolymer of **ethylene** and a copolymerizable C.sub.5 to C.sub.12 alpha olefin comonomer. The ethylene copolymer constituents of the film are characterized as having a density in the range of about 0.88 g/cm.sup.3 to abut 0.915 g/cm.sup.3, a melt index in the range of about 0.5 dg/min to about 7.5 dg/min, a molecular weight distribution (M.sub.w /M.sub.n) of about 1.5 to about 3.5 and an essentially single melting point in the range of about 60.degree. C. to about 115.degree. C., measured as a DSC peak T.sub.m.

SUMM This invention relates to laminar polyolefin film materials having a base layer comprising a blend of an olefin polymer and a **very low density ethylene**/alpha monoolefin copolymer and at least one heat sealable layer present on one or both surfaces of said base layer, said heat sealable layer comprising a **very low density** copolymer of **ethylene** and a different alpha monoolefin.

SUMM EPA 0247897 discloses a film laminate comprising a base layer which may contain polypropylene and at least one heat-sealable film layer which may be based on a **very low density** copolymer of **ethylene** and an alpha-monoolefin such as octene-1.

SUMM A class of highly active olefin catalysts known as metallocenes is well

known especially in the preparation of polyethylene and ethylene copolymers. These catalysts, particularly those based on group IV B transition metals such as zirconium, titanium and hafnium, show extremely high activity in **ethylene** polymerization. The **metallocene** catalysts are also highly flexible in that, by manipulation of catalyst composition and reaction conditions, they can be made to provide polyolefins with controllable molecular weights from as low as about 200 (useful in applications such as lube oil additives) to about I million or higher as, for example, ultra high molecular weight linear polyethylene. At the same time, the molecular weight distribution of the polymers can be controlled from extremely narrow (as in a polydispersity, M.sub.w /M.sub.n of about 2), to broad (a polydispersity of about 8).

SUMM Exemplary of the development of these **metallocene** catalysts for the polymerization of **ethylene** is found in U.S. Pat. No. 4,937,299 to Ewen et al., hereby incorporated herein by reference. Among other things, this patent teaches that the structure of the metallocene catalyst includes an alumoxane which is formed when water reacts with trialkyl aluminum with the release of methane, which alumoxane complexes with the metallocene compound to form the catalyst.

SUMM Metallocene catalyst are particularly attractive in making tailored ultrauniform and super random specialty copolymers. For example, if a lower density **ethylene** copolymer is made with a **metallocene** catalyst, such as very low density polyethylene (VLDPE), an ultrauniform and super random copolymerization will occur, as contrasted with the polymer produced by copolymerization using a conventional Ziegler catalyst.

SUMM The invention provides laminar polyolefin film materials having a base film layer comprising a blend of an olefin polymer and up to about 30% by weight of at least one **very low density** copolymer of **ethylene** and a C.sub.3 to C.sub.20 alpha monoolefin comonomer copolymerizable with ethylene, said base layer having a heat sealable film layer present on one or both surfaces thereof comprising a **very low density** copolymer of **ethylene** and a copolymerizable C.sub.3 to C.sub.20 alpha olefin comonomer, said film further characterized in that the ethylene/alpha monoolefin copolymer present in one of said layers is a copolymer of ethylene and a C.sub.6 C.sub.10 alpha monoolefin which alpha monoolefin differs from the alpha monoolefin present in the ethylene copolymer of the other said layers. The ethylene copolymer constituents of the film are characterized as having a density in the range of about 0.88 g/cm.sup.3 to abut 0.915 g/cm.sup.3, a melt index in the range of about 0.5 dg/min to about 7.5 dg/min, a molecular weight distribution (M.sub.w /M.sub.n) of about 1.5 to about 3.5 and an essentially single melting point in the range of about 60.degree. C. to about 115.degree. C., measured as a DSC peak T.sub.m.

=> d l11 40-49 ibib abs

L11 ANSWER 40 OF 56 USPATFULL on STN
ACCESSION NUMBER: 1999:132965 USPATFULL
TITLE: High density ethylene polymer and method for producing the same
INVENTOR(S): Matsushita, Fumio, Kurashiki, Japan
Yamaguchi, Fumihiko, Shizuoka-ken, Japan
Idehara, Tsutomu, Kurashiki, Japan
PATENT ASSIGNEE(S): Asahi Kasei Kogyo Kabushiki Kaisha, Osaka, Japan

(non-U.S. corporation)

| | NUMBER | KIND | DATE | |
|---|---|---|---|---|
| PATENT INFORMATION: | US 5973083 | | 19991026 | |
| | WO 9606117 | | 19960229 | |
| APPLICATION INFO.: | US 1997-793046 | | 19970327 | (8) |
| | WO 1995-JP1639 | | 19950818 | |
| | | | 19970327 | PCT 371 date |
| | | | 19970327 | PCT 102(e) date |

| | NUMBER | DATE |
|---|---|---|
| PRIORITY INFORMATION: | JP 1994-215218 | 19940818 |

DOCUMENT TYPE: Utility
FILE SEGMENT: Granted
PRIMARY EXAMINER: Smith, Edward J.
LEGAL REPRESENTATIVE: Birch, Stewart, Kolasch & Birch, LLP
NUMBER OF CLAIMS: 8
EXEMPLARY CLAIM: 1
NUMBER OF DRAWINGS: 5 Drawing Figure(s); 5 Drawing Page(s)
LINE COUNT: 1972
CAS INDEXING IS AVAILABLE FOR THIS PATENT.

AB Disclosed is a high density ethylene polymer comprising a homopolymer of ethylene, or a copolymer of ethylene with at least one comonomer selected from an .alpha.-olefin, a cyclic olefin, and linear, branched and cyclic dienes, and having the following properties: (a) a density d (g/cm.sup.3) of from 0.951 to 0.980; (b) an M.sub.I (g/10 minutes) of more than 3 and not more than 100 (M.sub.I is the melt flow rate as measured at 190.degree. C. under a load of 2.16 kg); (c) the polymer satisfying: log a.sub.kI .gtoreq.-0.844 log M.sub.I +1.462 [M.sub.I is as defined above, and a.sub.kI is the Izod impact strength (kgf.multidot.cm/cm.sup.2)]; (d) the polymer satisfying: log M.sub.IR .gtoreq.-0.094 log M.sub.I +1.520 [M.sub.I is as defined above, and M.sub.IR is the H.sub.MI /M.sub.I ratio in which H.sub.MI (g/10 minutes) is the melt flow rate as measured at 190.degree. C. under a load of 21.6 kg and M.sub.I is as defined above]; and wherein (e) the d (g/cm.sup.3) and the M.sub.I (g/10 minutes) satisfy: d.gtoreq.-0.00873 log M.sub.I +0.972. The ethylene polymer has excellent mechanical properties and excellent moldability, and can be advantageously produced by use of a catalyst comprising (A) a specific transition metal compound containing, as a ligand, an unsubstituted or substituted indenyl group, or di or tri substituted cyclopentadienyl group; (B) an inorganic solid component comprising a particulate inorganic solid having OH groups on a surface thereof and, carried thereon, an organoaluminumoxy compound having an alkyl group; and (C) an organoaluminum compound.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L11 ANSWER 41 OF 56 USPATFULL on STN
ACCESSION NUMBER: 1999:132335 USPATFULL
TITLE: Polyolefin compositions with balanced shrink properties
INVENTOR(S): Patel, Rajen M., Lake Jackson, TX, United States
deGroot, Jacquelyn A., Lake Jackson, TX, United States
PATENT ASSIGNEE(S): The Dow Chemical Company, Midland, MI, United States
(U.S. corporation)

| | NUMBER | KIND | DATE | |
|---|---|---|---|---|
| PATENT INFORMATION: | US 5972444 | | 19991026 | |
| APPLICATION INFO.: | US 1996-748322 | | 19961113 | (8) |
| RELATED APPLN. INFO.: | Continuation-in-part of Ser. No. US 1995-428273, filed | | | |

on 25 Apr 1995, now patented, Pat. No. US 5632510 which is a division of Ser. No. US 1993-55063, filed on 28 Apr 1993, now patented, Pat. No. US 5562958 which is a continuation-in-part of Ser. No. US 1992-916269, filed on 21 Jul 1992, now patented, Pat. No. US 5296175 And Ser. No. US 1993-24563, filed on 1 Mar 1993, now abandoned which is a continuation-in-part of Ser. No. US 1991-776130, filed on 15 Oct 1991, now patented, Pat. No. US 5272376

| | NUMBER | DATE |
|---|---|---|
| PRIORITY INFORMATION: | US 1996-11874P | 19960220 (60) |

DOCUMENT TYPE: Utility
FILE SEGMENT: Granted
PRIMARY EXAMINER: Wilson, Donald R.
NUMBER OF CLAIMS: 8
EXEMPLARY CLAIM: 1
NUMBER OF DRAWINGS: 1 Drawing Figure(s); 1 Drawing Page(s)
LINE COUNT: 1385
CAS INDEXING IS AVAILABLE FOR THIS PATENT.

AB This invention relates to an improved shrink film having balanced properties. In particular, this invention relates to a biaxially oriented polyolefin shrink film made from a particular polymer mixture which includes a first ethylene polymer component having a single differential scanning calorimetry (DSC) melting peak or a single Analytical Temperature Rising Elution Fractionation (ATREF) peak and a second ethylene polymer component having one or more DSC melting peaks, wherein the density differential between the two component polymers about 0 to about 0.03 g/cc. Improved properties include increased shrink responses, wide orientation windows, higher modulus and high softening temperatures.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L11 ANSWER 42 OF 56 USPATFULL on STN
ACCESSION NUMBER: 1999:85091 USPATFULL
TITLE: Thermoplastic C.sub.2 -.alpha.-olefin copolymer blends and films
INVENTOR(S): Wilhoit, Darrel Loel, Plainfield, IL, United States
Georgelos, Paul Nick, Naperville, IL, United States
PATENT ASSIGNEE(S): Viskase Corporation, Chicago, IL, United States (U.S. corporation)

| | NUMBER | KIND | DATE | |
|---|---|---|---|---|
| PATENT INFORMATION: | US 5928740 | | 19990727 | |
| APPLICATION INFO.: | US 1997-808093 | | 19970228 | (8) |

DOCUMENT TYPE: Utility
FILE SEGMENT: Granted
PRIMARY EXAMINER: Dye, Rena L.
LEGAL REPRESENTATIVE: Richeson, Cedric M.
NUMBER OF CLAIMS: 17
EXEMPLARY CLAIM: 1
LINE COUNT: 1211
CAS INDEXING IS AVAILABLE FOR THIS PATENT.

AB A polymer blend and mono-and multilayer films made therefrom having improved properties such as heat sealing or puncture resistance wherein the blend has a first polymer of ethylene and at least one .alpha.-olefin having a polymer melting point between 55 to 75.degree. C.; a second polymer of ethylene and at least one .alpha.-olefin having a polymer melting point between 85 to 110.degree. C. and a third

thermoplastic polymer having a melting point between 115 to 130.degree. C.; and optionally a fourth polymer e.g. EVA, having a melting point between 90 to 100.degree. C.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L11 ANSWER 43 OF 56 USPATFULL on STN
ACCESSION NUMBER: 1999:48141 USPATFULL
TITLE: Chlorine-free multilayer film material, process for its manufacture and its use
INVENTOR(S): Zavadsky, Emil, Ollon, Switzerland
Perego, Vittorio, Busto Arsizio, Italy
PATENT ASSIGNEE(S): W. R. Grace & Co.-Conn., Duncan, SC, United States (U.S. corporation)

| | NUMBER | KIND | DATE | |
|---|---|---|---|---|
| PATENT INFORMATION: | US 5895694 | | 19990420 | |
| APPLICATION INFO.: | US 1995-523979 | | 19950906 | (8) |

| | NUMBER | DATE |
|---|---|---|
| PRIORITY INFORMATION: | EP 1994-114057 | 19940907 |

DOCUMENT TYPE: Utility
FILE SEGMENT: Granted
PRIMARY EXAMINER: Nold, Charles
LEGAL REPRESENTATIVE: Lagaly, Thomas C.
NUMBER OF CLAIMS: 19
EXEMPLARY CLAIM: 1
NUMBER OF DRAWINGS: 1 Drawing Figure(s); 1 Drawing Page(s)
LINE COUNT: 733
CAS INDEXING IS AVAILABLE FOR THIS PATENT.
AB The present invention relates to a chlorine-free multilayer film material comprising

a) a gas-barrier layer (1) comprising a non-chlorine containing organic polymer which is substantially impermeable to oxygen gas;

b) two tie layers (2) each contacting one side of said barrier layer;

c) an inner surface layer (3);

d) an outer surface layer (4); and

e) two intermediate layers (5) positioned between said surface layers (3,4) and said tie layers (2), said barrier layers (5) comprising an ethylene-propylene copolymer having a flexural modulus of less than 200 MPa and preferably less than 150 MPa. a process for the manufacture of this film material and its use for the manufacture of bags and pouches for ostomy/urostomy use.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L11 ANSWER 44 OF 56 USPATFULL on STN
ACCESSION NUMBER: 1998:153939 USPATFULL
TITLE: High strength flexible film package
INVENTOR(S): Compton, Stephen F., Spartanburg, SC, United States
PATENT ASSIGNEE(S): W. R. Grace & Co.-Conn., Duncan, SC, United States (U.S. corporation)

| | NUMBER | KIND | DATE |
|---|---|---|---|

PATENT INFORMATION: US 5846620 19981208
APPLICATION INFO.: US 1997-796831 19970206 (8)
DOCUMENT TYPE: Utility
FILE SEGMENT: Granted
PRIMARY EXAMINER: Loring, Susan A.
ASSISTANT EXAMINER: Devi, S.
LEGAL REPRESENTATIVE: Hurley, Jr., Rupert B.
NUMBER OF CLAIMS: 25
EXEMPLARY CLAIM: 1
NUMBER OF DRAWINGS: 6 Drawing Figure(s); 3 Drawing Page(s)
LINE COUNT: 2035
CAS INDEXING IS AVAILABLE FOR THIS PATENT.

AB An article, such a bag, pouch, casing, or sheet formed from joined film pieces, comprises a non-crosslaminated film. The article has a parallel plate burst strength of at least 300 inches of water more preferably, from about 300 to 2000 inches of water. The film comprises one or more of a wide variety of polymers, with linear low density polyethylene being a preferred polymer. The film is heat scaled to itself or another film (preferably a similar or identical film). Preferably, the film has a total thickness of from about 3 to 20 mils. The burst strength is surprising in view of the fact that the film is not cross-laminated.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L11 ANSWER 45 OF 56 USPATFULL on STN
ACCESSION NUMBER: 1998:84761 USPATFULL
TITLE: Liquid plastic film pouch with inner straw
INVENTOR(S): Edwards, John, Montreal, Canada
Larson, Raymond L., Fargo, ND, United States
PATENT ASSIGNEE(S): Glopak Inc., Montreal, Canada (non-U.S. corporation)

| | NUMBER | KIND | DATE | |
|---|---|---|---|---|
| PATENT INFORMATION: | US 5782344 | | 19980721 | |
| APPLICATION INFO.: | US 1997-806126 | | 19970228 | (8) |

DOCUMENT TYPE: Utility
FILE SEGMENT: Granted
PRIMARY EXAMINER: Fidei, David T.
LEGAL REPRESENTATIVE: Houle, Guy, Carter, David M.
NUMBER OF CLAIMS: 10
EXEMPLARY CLAIM: 1
NUMBER OF DRAWINGS: 9 Drawing Figure(s); 3 Drawing Page(s)
LINE COUNT: 342

AB A liquid product carrying plastic film pouch (10) having a straw (12) free-floating in the liquid product (11) is described. The liquid product (11) contained within the inner chamber (13) of the pouch occupies from about 60% to about 90% of the volume of the inner chamber (13) of the pouch and a portion of air from the remaining volume is evacuated in sufficient quantity to permit the side walls (14,15) of the pouch to be collapsed against one another when the pouch is grasped by the hand of a user person. By collapsing the side walls (14,15) together the straw (12) located within the liquid can be grasped and manipulated to puncture the plastic film pouch (1) to extend a portion (12') of the straw (12) exteriorly of the pouch whereby to extract liquid therefrom. The pouch (10) is made of a multilayer resin film having an inner sealant layer (26) formed of a linear low density ethylene-octene copolymer or **very low density ethylene** copolymer (octene or other copolymers) such that when the straw punctures the film, the inner sealant layer (26) forms a membrane about the straw which exhibits a self-sealing behavior so as to prevent leakage in the punctured region as liquid is extracted from the pouch (10) through the straw (12).

L11 ANSWER 46 OF 56 USPATFULL on STN
ACCESSION NUMBER: 97:99081 USPATFULL
TITLE: Highly flexible multilayer films for various medical applications
INVENTOR(S): Mueller, Walter B., Inman, SC, United States
PATENT ASSIGNEE(S): W. R. Grace & Co.-Conn., Duncan, SC, United States (U.S. corporation)

| | NUMBER | KIND | DATE | |
|---|---|---|---|---|
| PATENT INFORMATION: | US 5681627 | | 19971028 | |
| APPLICATION INFO.: | US 1995-505435 | | 19950721 | (8) |

DOCUMENT TYPE: Utility
FILE SEGMENT: Granted
PRIMARY EXAMINER: Dye, Rena
LEGAL REPRESENTATIVE: Lagaly, Thomas C.
NUMBER OF CLAIMS: 21
EXEMPLARY CLAIM: 1
NUMBER OF DRAWINGS: 2 Drawing Figure(s); 1 Drawing Page(s)
LINE COUNT: 820
CAS INDEXING IS AVAILABLE FOR THIS PATENT.
AB A multilayer film generally includes a first exterior layer of polyurethane and a second exterior layer which can be formed from polyurethane, a homopolymer or copolymer of polypropylene, a blend of homopolymer or copolymer of polypropylene and elastomer, high density polyethylene, or mixtures of the foregoing. Such multilayer film is highly flexible and is advantageously used for various medical applications, such as the production of flexible pouches for the packaging and administration of medical solutions, drainage pouches, compression devices, and thermal blankets.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L11 ANSWER 47 OF 56 USPATFULL on STN
ACCESSION NUMBER: 97:40542 USPATFULL
TITLE: Multi-layer packaging film and receptacles made therefrom
INVENTOR(S): Desai, Bankim B., Mississauga, Canada
Thomson, David H., Mississauga, Canada
Moir, William A., Mississauga, Canada
PATENT ASSIGNEE(S): W.R. Grace & Co.-Conn., Duncan, SC, United States (U.S. corporation)

| | NUMBER | KIND | DATE | |
|---|---|---|---|---|
| PATENT INFORMATION: | US 5629059 | | 19970513 | |
| APPLICATION INFO.: | US 1993-163451 | | 19931207 | (8) |

DOCUMENT TYPE: Utility
FILE SEGMENT: Granted
PRIMARY EXAMINER: Thibodeau, Paul J.
ASSISTANT EXAMINER: Sand, Stephen
LEGAL REPRESENTATIVE: Hurley, Jr., Rupert B., Gregory, Leigh P.
NUMBER OF CLAIMS: 29
EXEMPLARY CLAIM: 1
LINE COUNT: 1146
CAS INDEXING IS AVAILABLE FOR THIS PATENT.
AB A multi-layer, oriented, heat shrinkable thermoplastic film comprising: (i) a layer composed of a blend of ethylene-vinyl acetate copolymer and a linear ethylene-alpha-olefin copolymer; (ii) a layer composed of (a) a linear ethylene-alpha-olefin copolymer; (b) a material selected from the

group consisting of ethylene-vinyl acetate copolymers and ethylene-n-butyl acrylate copolymers; and (c) a narrow molecular weight linear ethylene-alpha-olefin copolymer having a density of less than 0.900 g/cc; (iii) a layer composed of a vinylidene chloride copolymer or an ethylene-vinyl acetate copolymer in which the acetate moieties have been partially or completely hydrolyzed; and (iv) a layer composed of a copolymer of ethylene-vinyl acetate or a blend of ethylene-vinyl acetate copolymer and ethylene-alpha-olefin copolymer.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L11 ANSWER 48 OF 56 USPATFULL on STN

| | |
|---|---|
| ACCESSION NUMBER: | 95:84248 USPATFULL |
| TITLE: | Elastic articles and a process for their production |
| INVENTOR(S): | Erderly, Thomas C., Baytown, TX, United States<br>Mehta, Aspy K., Humble, TX, United States<br>Middlesworth, Jeffrey A., Wauconda, IL, United States |
| PATENT ASSIGNEE(S): | Exxon Chemical Patents Inc., Wilmington, DE, United States (U.S. corporation) |

| | NUMBER | KIND | DATE |
|---|---|---|---|
| PATENT INFORMATION: | US 5451450 | | 19950919 |
| APPLICATION INFO.: | US 1993-92403 | | 19930714 (8) |

RELATED APPLN. INFO.: Continuation-in-part of Ser. No. US 1993-68374, filed on 27 May 1993, now abandoned which is a continuation-in-part of Ser. No. US 1992-837769, filed on 19 Feb 1992, now patented, Pat. No. US 5241031

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| DOCUMENT TYPE: | Utility |
| FILE SEGMENT: | Granted |
| PRIMARY EXAMINER: | Teskin, Fred |
| LEGAL REPRESENTATIVE: | Sher, Jaimes |
| NUMBER OF CLAIMS: | 34 |
| EXEMPLARY CLAIM: | 1 |
| NUMBER OF DRAWINGS: | 1 Drawing Figure(s); 1 Drawing Page(s) |
| LINE COUNT: | 798 |

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

AB Disclosed is an elastic film having improved properties. The elastic film can be blown, cast or cast embossed. The elastic film is processed by polymerizing olefins in the presence of a metallocene catalyst system.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L11 ANSWER 49 OF 56 USPATFULL on STN

| | |
|---|---|
| ACCESSION NUMBER: | 95:22762 USPATFULL |
| TITLE: | Biaxially oriented heat-shrinkable film |
| INVENTOR(S): | Georgelos, Paul N., Oak Park, IL, United States<br>Pelkie, James E., Centerville, IA, United States<br>Wilhoit, Darrel L., Plainfield, IL, United States |
| PATENT ASSIGNEE(S): | Viskase Corporation, Chicago, IL, United States (U.S. corporation) |

| | NUMBER | KIND | DATE |
|---|---|---|---|
| PATENT INFORMATION: | US 5397640 | | 19950314 |
| APPLICATION INFO.: | US 1994-189370 | | 19940131 (8) |

RELATED APPLN. INFO.: Continuation-in-part of Ser. No. US 1992-855826, filed on 23 Mar 1992, now patented, Pat. No. US 5283128, issued on 1 Feb 1994

| | |
|---|---|
| DOCUMENT TYPE: | Utility |
| FILE SEGMENT: | Granted |

PRIMARY EXAMINER: Buffalow, Edith
LEGAL REPRESENTATIVE: Bobrowicz, D., LeFever, J. C.
NUMBER OF CLAIMS: 16
EXEMPLARY CLAIM: 1
LINE COUNT: 1556
AB An improved biaxially oriented heat-shrinkable film of the type used for packaging food, such as poultry, processed meat, and fresh meat.

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L11 ANSWER 40 OF 56 USPATFULL on STN
SUMM On the other hand, it has recently been found that when a catalyst system comprising a solvent-soluble transition metal compound containing at least one halogen, such as bis(cyclopentadienyl)zirconium dichloride, and an aluminoxane is used for homopolymerization of ethylene or copolymerization of ethylene with an .alpha.-olefin, the catalyst system exhibits high polymerization activity. With respect to the details of this technique, reference can be made to, for example, Examined Japanese Patent Application Publication No. 4-12283 (corresponding to DE 3127133.2). Further, an improved technique over the technique disclosed in the above-mentioned Examined Japanese Patent Application Publication No. 4-12283 is disclosed in, for example, Unexamined Japanese Patent Application Laid-Open Specification No. 60-35007. The catalyst system proposed in these prior art documents is attracting attention as the so-called metallocene catalyst system. By using such a **metallocene** catalyst system, an **ethylene** polymer having a narrow molecular weight distribution can be produced, wherein, when the ethylene polymer produced is an ethylene copolymer, the copolymer has not only a narrow molecular weight distribution, but also a narrow copolymerization distribution (i.e., narrow distribution with respect to the proportions of different component monomer units constituting the copolymer). By virtue of having a narrow molecular weight distribution, an ethylene polymer produced by using such a metallocene catalyst system has advantages in that it has high mechanical properties, such as high impact resistance, that it is substantially free of low molecular weight components and high molecular weight components (both of which pose problems, such as high tack and gellation), and that it has excellent properties, such as high resistance to solvent extraction and high transparency. Therefore, energetic researches have conventionally been made on the use of a metallocene catalyst system mainly for producing, for example, a linear low density ethylene polymer (LLDPE), a **very low density ethylene** polymer (VLDPE) and an ultralow density ethylene polymer (ULDPE). As mentioned above, on one hand, an **ethylene** polymer produced by using a **metallocene** catalyst system has such great advantages by virtue of the narrow molecular weight distribution thereof; however, on the other hand, such an ethylene polymer has a problem in that it has an extremely poor moldability due to its narrow molecular weight distribution. Because of this problem, conventionally, with respect to the development of the application of a metallocene catalyst system in production of high density ethylene polymers, which are required to have a good balance between mechanical properties and moldability, a remarkable progress has not yet been achieved.

SUMM In order to solve these problems, in the production of an **ethylene** copolymer by using a **metallocene** catalyst, it has recently been attempted to produce an ethylene copolymer which is advantageous in that it not only has both a narrow copolymerization distribution and a narrow molecular weight distribution, but also has

excellent melt properties. For example, International Patent Application Publication No. W093/08221 proposes a method for producing an ethylene copolymer having improved melt flowability while maintaining a narrow molecular weight distribution thereof. In this proposed method, copolymerization is performed by using a specific **metallocene** catalyst to thereby cause the **ethylene** copolymer to have a long branched chain. However, such an ethylene copolymer has a problem in that, although the melt flowability is improved to some extent, the mechanical properties, such as impact resistance, are considerably lowered, as compared with those of an ethylene copolymer produced by using an ordinary metallocene catalyst.

DETD Further, with respect to **ethylene** polymers produced using a conventional **Ziegler-Natta** catalyst, the relationship between the M.sub.I and the Izod impact strength and the relationship between the M.sub.I and the density (d) are also shown in FIGS. 1 and 2, respectively.

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L11 ANSWER 48 OF 56 USPATFULL on STN

DETD In the invention, the type of elastomer utilized will depend upon economics and the properties desired in the final end product. Generally the elastomer can be any of the group consisting of plastomer, styrene-butadiene copolymer, polychloroprene (neoprene), nitrile rubber, butyl rubber, polysulfide rubber (Thiokol), cis-1,4-polyisoprene, ethylene-propylene co and terpolymers (EPR and EPDM rubber), silicone rubber and polyurethane rubber or blends of them with other polymers. In the preferred embodiment, the elastomer utilized in the present invention is a plastomer. The term "plastomer" as used herein refers generally to a class of ethylene based polymers with density of less than about 0.900 g/cm.sup.3 (down to about 0.855 g/cm.sup.3) at a molecular weight, Mw, greater than about 20,000 (about 200 MI and lower). Plastomers have an ethylene crystallinity between linear low density plastics and **very low density** polyethylenes and **ethylene**/alpha-olefin elastomers.

DETD Metallocenes are well known especially in the preparation of polyethylene and copolyethylene-alpha-olefins. These catalysts, particularly those based on Group IV transition metals, zirconium, titanium and hafnium, show extremely high activity in **ethylene** polymerization. The **metallocene** catalysts are also highly flexible in that, by manipulation of catalyst composition and reaction conditions, they can be made to provide polyolefins with controllable molecular weights from as low as about 200 (useful in applications such as lube oil additives) to about 1 million or higher, as for example in ultra high molecular weight linear polyethylene. At the same time, the molecular weight distribution of the polymers can be controlled from extremely narrow (as in a polydispersity, M.sub.w /M.sub.n, of about 2), to broad (as in a polydispersity of about 8).

DETD For the purposes of this patent specification the term "metallocene" is herein defined to contain one or more cyclopentadienyl moiety in combination with a transition metal of the Periodic Table of Elements. The metallocene catalyst component is represented by the general formula (C.sub.p).sub.m MR.sub.n R'.sub.p wherein C.sub.p is a substituted or unsubstituted cyclopentadienyl ring; M is a Group IV, V or VI transition metal; R and R' are independently selected halogen, hydrocarbyl group, or hydrocarboxyl groups having 1-20 carbon atoms; m=1-3, n=0-3, p=0-3, and the sum of m+n+p equals the oxidation state of M. Various forms of the catalyst system of the metallocene type may be used in the polymerization process of this invention. Exemplary of the development of these **metallocene** catalysts for the polymerization of

**ethylene** is found in the disclosure of U.S. Pat. No. 4,871,705 to Hoel, U.S. Pat. No. 4,937,299 to Ewen, et al. and EP-A-0 129 368 published Jul. 26, 1989, and U.S. Pat. Nos. 5,017,714 and 5,120,867 to Welborn, Jr. all of which are fully incorporated herein by reference. These publications teach the structure of the metallocene catalysts and includes alumoxane as the cocatalyst. There are a variety of methods for preparing alumoxane of which one described in U.S. Pat. No. 4,665,208. Other cocatalysts may be used with metallocenes, such as trialkylaluminum compounds; or ionizing ionic activators or compounds such as, tri (n-butyl) ammonium tetra (pentaflurophenyl) boron, which ionize the neutral metallocene compound. Such ionizing compounds may contain an active proton, or some other cation associated with but not coordinated or only loosely coordinated to the remaining ion of the ionizing ionic compound. Such compounds are described in EP-A-0 277 003 and EP-A-0 277 004 both published Aug. 3, 1988 and are both herein fully incorporated by reference. Further, the metallocene catalyst component can be a monocyclopentadienyl heteroatom containing compound. This heteroatom is activated by either an alumoxane or an ionic activator to form an active polymerization catalyst system to produce polymers useful in this present invention. These types of catalyst systems are described in, for example, PCT International Publications WO 92/00333 published Jan. 9, 1992, U.S. Pat. Nos. 5,096,867 and 5,055,438, EP-A-0 420 436 and WO 91/04257 all of which are fully incorporated herein by reference. In addition, the metallocene catalysts useful in this invention can include non-cyclopentadienyl catalyst components, or ancillary ligands such as boroles or carbollides in combination with a transition metal. Additionally it is not beyond the scope of this invention that the catalysts and catalyst systems may be those described in U.S. Pat. No. 5,064,802 and PCT publications WO 93/08221 and WO 93/08199 published Apr. 29, 1993 all of which are herein incorporated by reference. All the catalyst systems described above may be, optionally, prepolymerized or used in conjunction with an additive or scavenging component to enhance catalytic productivity.

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=> file inpadoc
COST IN U.S. DOLLARS                                SINCE FILE      TOTAL
                                                       ENTRY    SESSION
FULL ESTIMATED COST                                    81.52     273.27

DISCOUNT AMOUNTS (FOR QUALIFYING ACCOUNTS)          SINCE FILE      TOTAL
                                                       ENTRY    SESSION
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                           9 DEC 2003      <20031209/UPLS>
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>>> FOR CHANGES IN INPADOC ---> SEE HELP CHANGE
(LAST UPDATED SEP 9, 2003) <<<

=> s su 218416/pn
L12 0 SU 218416/PN
(SU218416/PN)

=> file caplus

| COST IN U.S. DOLLARS | SINCE FILE ENTRY | TOTAL SESSION |
|---|---|---|
| FULL ESTIMATED COST | 0.76 | 274.03 |

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FILE COVERS 1907 - 11 Dec 2003 VOL 139 ISS 24
FILE LAST UPDATED: 10 Dec 2003 (20031210/ED)

This file contains CAS Registry Numbers for easy and accurate
substance identification.

=> s su 218416/pn
L13 1 SU 218416/PN
(SU218416/PN)

=> d l13 all

L13 ANSWER 1 OF 1 CAPLUS COPYRIGHT 2003 ACS on STN
AN 1968:478222 CAPLUS
DN 69:78222
ED Entered STN: 12 May 1984
TI Heterogeneous, anion exchange membranes
IN Pashkov, A. N.; Nefedova, G. Z.; Leikin, Yu. A.; Tereshchenko, V. N.;
Tereshchenko, M. N.; Pavlova, E. A.
SO U.S.S.R.
From: Izobret., Prom. Obraztsy, Tovarnye Znaki 1968, 45(17), 77.
CODEN: URXXAF

DT Patent
LA Russian
IC C08F
CC 37 (Plastics Fabrication and Uses)
FAN.CNT 1

| | PATENT NO. | KIND | DATE | APPLICATION NO. | DATE |
|---|---|---|---|---|---|
| PI | SU 218416 | | 19680517 | SU | 19670203 <-- |

AB The title substance is prepd. by rolling a mixt. of anion exchanger and binder and subsequently pressing. An ion exchanger contg. quaternary NH4 groups and a mixt. of sulfochlorinated polyethylene and a hexafluoropropylene-vinylidene fluoride copolymer are used as the anion exchanger and binder, resp.

ST polyethylene sulfochlorinated ion exchangers; ion exchangers sulfochlorinated polyethylene; membranes anion exchanging

IT Membranes
(anion-exchanging, chlorosulfonated and aminated ethylene polymers contg. 1,1-difluoroethylene-hexafluoropropene polymer binders as)

IT 9011-17-0
RL: USES (Uses)
(as binder for chlorosulfonated and aminated ethylene polymer anion-exchanging membranes)

IT 9002-88-4, uses and miscellaneous
RL: USES (Uses)
(chlorosulfonated and aminated, as anion-exchanging membranes, 1,1-difluoroethylene-hexafluoropropene polymers as binder for)

=> log y

| COST IN U.S. DOLLARS | SINCE FILE ENTRY | TOTAL SESSION |
|---|---|---|
| FULL ESTIMATED COST | 6.53 | 280.56 |

| DISCOUNT AMOUNTS (FOR QUALIFYING ACCOUNTS) | SINCE FILE ENTRY | TOTAL SESSION |
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